PHASE III REMOVAL ACTION REPORT

Former P.R. Mallory Plant Site
Crawfordsville, Indiana

OCTOBER 1993

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CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

1.1 GENERAL

The former P.R. Mallory Plant Site (Site) is located approximately three miles east of Crawfordsville, Indiana on the north side of State Road 32, as shown on Figure 1.1. P.R. Mallory manufactured dielectric capacitors at the Site from 1957 to 1969. During this period, a variety of dielectric fluids, including oils containing polychlorinated biphenyls (PCBs), were used in the manufacturing process. Operations were temporarily suspended in 1968 after a fire destroyed the impregnation room in the northeastern section of the plant. Operations were resumed until 1969 when a second fire destroyed the entire plant.

The Site encompasses approximately four acres. The Site is bordered by State Road 32 on the south, Superior Moving and Storage on the east, Little Sugar Creek on the north and Servies Enterprises (land formerly owned by Terra Products Inc.) on the west[1]. Prior to implementation of the Phase III Removal Action, a concrete slab from the former plant building was located on the southern portion of the Site. A pumphouse and incinerator for the former plant were located north of the concrete slab. A ravine and intermittent stream run through the northern portion of the Site and connect with Little Sugar Creek at the northern boundary. The general Site layout prior to implementation of the Phase III Removal Action is illustrated on Plan 1.

United States Environmental Protection Agency (USEPA) issued an amended Administrative Order on August 20, 1986 which required the respondents [Duracell International Inc. (Duracell), Terra Products (Terra), and Superior Moving and Storage (Superior)] to implement emergency removal activities at the former plant site.

1 To maintain consistency with previous reports prepared by Conestoga-Rovers & Associates with respect to the Site, this report will continue to refer to the property currently owned by Servies Enterprises, as Terra Products property.

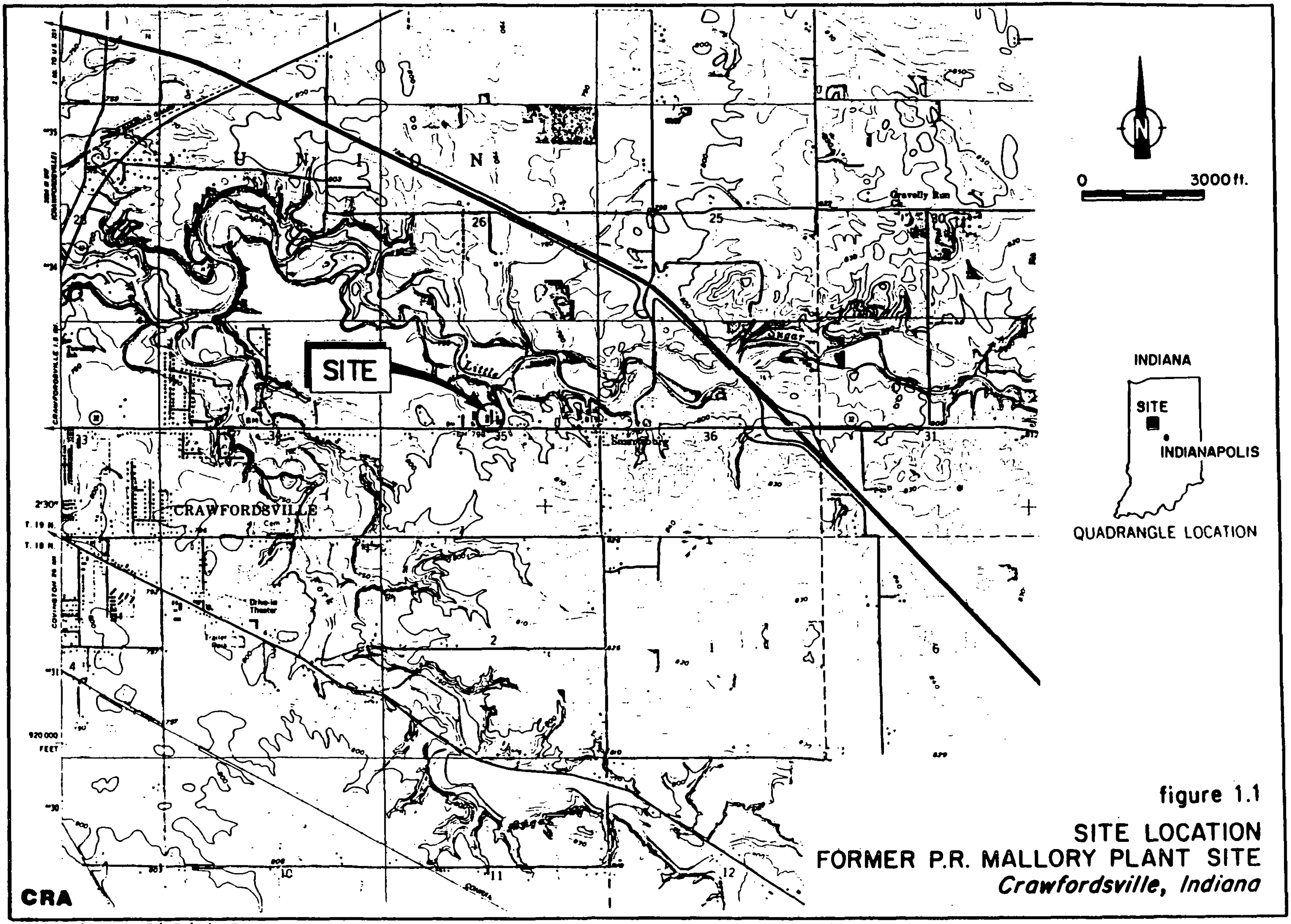

figure 1.1

SITE LOCATION
FORMER P.R. MALLORY PLANT SITE
Crawfordsville, Indiana

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In response to the Administrative Order issued by USEPA, Duracell has implemented emergency removal activities at the Site in three separate phases. Phase I construction activities performed at the Site included construction of a security fence around the plant site and disposal areas, excavation and on-Site securement of capacitors and PCB-contaminated soil and debris within the fenced area, implementation of a comprehensive sampling and analysis plan for Site characterization, and development and implementation of a hydrogeological investigation.

Phase II construction activities performed at the Site included removal of significantly contaminated soils from areas outside the Site security fence and placement of the soils in a containment cell constructed on the Site. This work was undertaken to minimize the potential for the continued release of contaminants to the environment and to restrict the public access and exposure to potentially contaminated materials.

The Phase III RA comprised the Phase III Removal Action, implemented at the Site between November 1988 and August 1990, and the Phase III Supplemental Removal Action, implemented at the Site between February 1993 and August 1993 (in this report the Phase III Removal Action and Phase III Supplemental Removal Action will be referred to collectively as the Phase III RA). Implementation of the Phase III RA included the excavation and off-Site disposal of residually contaminated soil, concrete and debris for which levels of PCB contamination exceeded predetermined cleanup criteria approved by the Indiana Department of Environmental Management (IDEM) and USEPA, as well as removal and off-Site disposal of capacitor and liquid wastes.

The Phase III Removal Action Report (Phase III RAR) presented herein identifies the activities undertaken by Duracell during the Phase III RA. The report includes:

i) a summary of the various submissions made to USEPA and IDEM;
ii) a description of activities undertaken prior to the Phase III RA;
iii) a description of the Phase III RA activities performed at the Site; and

iv) a review of the sampling and analysis program implemented during the Phase III RA.

Specific details pertaining to the sampling and analysis program implemented during the Phase III RA are presented under separate cover in a report entitled "Phase III Sampling and Analysis Report, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" (Phase III SAR), dated October 1993 and prepared by Conestoga-Rovers & Associates (CRA).

1.2 SITE BACKGROUND

IDEM conducted a Site inspection of the former P.R. Mallory facility on October 10, 1985. During the inspection, IDEM representatives observed capacitors lying on the ground surface and along the bank of a ravine adjacent to the plant site.

On April 15, 1986 IDEM representatives collected three capacitors from the apparent capacitor disposal area. Subsequent analysis of oil from the capacitors indicated PCB concentrations in the oil as high as 100 percent.

As a result of the Site inspections, IDEM requested the USEPA to investigate and initiate a removal action at the Site.

On April 19, 1986, USEPA representatives conducted a Site assessment which included a preliminary soil sampling program. The results of the sampling program indicated that PCB concentrations in the soil in the apparent capacitor disposal area ranged from 326 milligrams per kilogram (mg/kg) to 165,402 mg/kg. Based on the Site assessment, an Administrative Order was issued on June 23, 1986 to Duracell, the former Site owner and operator, and to Terra, the Site owner as of June 23, 1986. Under the terms of the Administrative Order, respondents were required to restrict access to the Site; perform a contamination assessment of the facility; and develop and implement a work plan to remove and secure capacitors and contaminated soil and debris. A meeting was held between Duracell and IDEM on June 26,

1986. Duracell representatives also met with IDEM and USEPA officials on July 7, 1986 to review the Administrative Order and Duracell's proposed schedule of work activities.

The work activities identified in Duracell's proposed schedule included:

i) a legal boundary survey of the Site;
ii) installation of a security fence around the Site;
iii) installation of a sediment trap and oil adsorbent boom in the ravine;
iv) preliminary soil sampling and analysis to determine contaminants of concern;
v) preparation and submission of a comprehensive work plan and health and safety plan to the Agencies (USEPA and IDEM);
vi) implementation of the approved work plan; and
vii) submission of a final report.

The legal boundary survey of the Site, initiated by Duracell, indicated that the apparent disposal area was located outside the former P.R. Mallory property, on land occupied by Superior.

USEPA issued an amended Administrative Order on August 20, 1986. The amended order incorporated the work activities identified in Duracell's proposed schedule of work activities and named Superior as a respondent, thereby providing access to the suspected disposal area.

Preliminary work at the Site was initiated prior to issuance of USEPA's amended Administrative Order to ensure the response action proceeded in an expeditious manner.

Duracell submitted a proposed sampling and analysis plan in a report entitled "Work Plan, Initial Site Screening, Former P.R. Mallory Plant Site, Crawfordsville, Indiana", dated July 1986 and prepared by CRA, to the Agencies on July 14, 1986. The plan was intended to identify contaminants of concern present at the Site prior to development of a remedial work plan and health and safety plan. The sampling plan was conditionally approved by USEPA on July 28, 1986.

Construction of a security fence around the Site and disposal area commenced on August 11, 1986 and was completed by August 28, 1986. A sediment trap constructed of hay bales and an oil absorbent boom were installed in the ravine concurrently with the installation of the fence.

The preliminary sampling and analysis program was conducted at the Site by CRA. Samples were collected at the Site on August 6, 1986 in accordance with the approved sampling plan. The results of the sampling program are presented in a report entitled "Initial Site Screening: Sampling Program, Former P.R. Mallory Plant Site, Crawfordsville, Indiana", forwarded to the USEPA and the IDEM by Duracell on September 18, 1986.

The preliminary sampling and analysis program confirmed the presence of PCBs, dioxins and dibenzofurans in the soil at the Site. PCB concentrations in the soil ranged from a maximum of 130,000 mg/kg in the main disposal area to 7,200 mg/kg adjacent to the incinerator. Concentrations of total dioxin varied from 40.1 micrograms per kilogram (μg/kg) in the disposal area to 0.75 μg/kg in the ravine; dibenzofuran concentrations varied from approximately 1.0 mg/kg to a maximum concentration of 5.1 mg/kg detected in the disposal area.

Based on the results of the preliminary sampling and analysis program Duracell developed a work plan as presented in the report entitled "Response Action Work Plan, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" (RAWP) dated October 1986 and prepared by CRA, for the Site . The RAWP proposed to undertake remedial activities at the Site in two phases. Phase I of the plan included excavation and on-Site securement of capacitors and contaminated soil and debris; implementation of a comprehensive sampling and analysis plan; and, development and implementation of a hydrogeological investigation. The scope of any subsequent action at the Site would be dependent on data generated from the

Phase I program. Duracell submitted the RAWP to the Agencies for review on October 9, 1986.

Duracell met with USEPA and IDEM on October 27, 1986 to review the RAWP. A revised RAWP was forwarded to the Agencies on October 31, 1986; the revised RAWP was accompanied by detailed specifications and plans for the Phase I construction program, as requested by USEPA. USEPA conditionally approved the RAWP on November 12, 1986.

A Quality Assurance Project Plan entitled "Quality Assurance Project Plan (QAPP), Former P.R. Mallory Plant Site, Crawfordsville, Indiana" (QAPP), dated November 1986 and prepared by CRA, was developed to identify sampling and analytical activities associated with the field investigation component of the RAWP. The QAPP was forwarded to the Agencies on November 13, 1986. IDEM commented on the QAPP by letter dated December 22, 1986. CRA responded to the comments in a letter dated January 6, 1987.

The Phase I activities performed at the Site consisted of three main activities including construction activities, a Site sampling and analysis program and a hydrogeological investigation. All activities were carried out concurrently, during the period from November 30, 1986 to January 16, 1987.

Phase I construction activities included:

i) construction of a concrete decontamination pad;
ii) construction of a concrete soil storage cell; and
iii) removal of capacitors, contaminated soil and debris, and on-Site securement in the newly constructed storage cell.

Details of the Phase I construction activities performed at the Site were submitted to the Agencies on February 23, 1987 in a report entitled "Phase I Remedial Action Report, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" dated February 1987 and prepared by CRA.

The Site sampling and analysis program conducted during Phase I activities involved the collection of 221 soil, 25 sediment, 19 surface water, 10 groundwater, 3 air, 5 concrete core, and 6 surface wipe samples. Details of the sampling and analysis program are included in a report entitled "Phase I Sampling and Analysis Report, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" dated April 1987 and prepared by CRA, submitted to the Agencies on April 3, 1987.

The hydrogeological investigation performed at the Site during Phase I activities included the installation of a total of seven observation wells at five locations on Site, and collecting representative groundwater samples from the wells. Details of the Phase I hydrogeological investigation are presented in a report entitled "Hydrogeological Investigation, Interim Report, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" dated March 1987 and prepared by CRA, submitted to the Agencies on April 3, 1987.

Following a review of the data generated during the Phase I sampling and analysis program, an additional sampling program was developed in order to further delineate the areal and vertical extent of residual soil contamination at the Site. The proposed supplemental sampling program was presented in a report entitled "Phase I Supplemental Soil Sampling Program, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" dated April 1987 and prepared by CRA, submitted to the Agencies for review on April 14, 1987. The Phase I supplemental soil sampling program was conditionally approved by IDEM and USEPA by letter dated May 6, 1987. The supplemental samples were collected at the Site between May 8 and May 15, 1987. Concurrent with the supplemental soil sampling, a second round of groundwater samples was also collected. Details of the supplemental soil sampling and second round of groundwater sampling are presented in reports entitled "Phase I Supplemental Sampling and Analysis Report, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" dated September 1987 and prepared by CRA, and "Hydrogeological Investigation Supplemental Data Report, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" dated July 1987 and prepared by CRA; both reports were submitted to the Agencies on July 20, 1987.

On September 11, 1987, an updated report entitled "Phase I Supplemental Sampling and Analysis Report, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" dated September 1987 and prepared by CRA, was forwarded to the Agencies for review. This report was revised and reissued, to incorporate results of dioxin/furan analyses not previously included in the original submission and to correct laboratory reporting errors for several of the PCB results.

Based on information obtained during Phase I Remedial Action and Phase I supplemental sampling and analysis programs, Duracell developed an additional work plan, as detailed in a report entitled "Phase II Response Action Work Plan, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" (Phase II RAWP) dated October 1987 and prepared by CRA, for additional work at the Site. Duracell submitted the Phase II RAWP to USEPA and IDEM for review on November 5, 1987. USEPA conditionally approved the Phase II RAWP on December 2, 1987.

The Phase II activities performed at the Site consisted of three main activities including construction activities, an investigative and confirmatory sampling program, and additional hydrogeological investigation. All activities were carried out concurrently, during the period of February 8, 1988 to March 14, 1988.

Phase II construction activities included:

i) construction of a second concrete storage cell;

ii) excavation of soil and debris containing elevated concentrations of PCBs, and on-Site securement in the second concrete storage cell. Materials excavated were formerly accessible to the public, and included an area to the north of Superior's parking lot and the upstream portion of the ravine invert outside the Site security fence; and

iii) delineation of a number of underground pipes identified at the former plant facility.

Details of the Phase II construction activities were submitted to the Agencies in September 1988 in a report entitled "Phase II Remedial Action Report, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" dated September 1988 and prepared by CRA.

Details of the confirmatory and investigative sampling program conducted during Phase II are presented in a report entitled "Phase II Sampling and Analysis Report, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" dated September 1988 and prepared by CRA, submitted to the Agencies in September 1988.

The hydrogeological investigation performed at the Site during the Phase II activities included the collection of a third round of water samples from the seven existing on-Site observation wells and from Terra's and Superior's wells, installation and sampling of two new shallow observation wells, sampling of the former plant production well, and the drilling of a borehole adjacent to the production well to obtain samples for geologic record. Details of the Phase II hydrogeological investigation are presented in a report entitled "Phase II Hydrogeological Investigation, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" dated September 1988 and prepared by CRA, submitted to the Agencies in September 1988.

Following completion of the Phase II activities, Kraft Inc. was sold to Duracell Holdings Corporation. Battery Properties Inc., a subsidiary of Kraft, Inc., took title to properties that were not conveyed to Duracell Holdings Corporation. The Phase III Removal Action was conducted under the authority of Battery Properties Inc. or Kraft Inc., as appropriate. Between completion of the Phase III Removal Action in August 1990 and commencement of the Phase III Supplemental Removal Action in February 1993, as detailed in this report, transactions occurred within Kraft Inc. such that the Phase III Supplemental Removal Action was conducted under the authority of Kraft General Foods, Inc. Details of the Phase III RA are presented in the following sections.

2.0 PRE-CONSTRUCTION ACTIVITIES - PHASE III REMOVAL ACTION

2.1 GENERAL

Based on information obtained during all previous sampling and analysis programs and removal programs conducted at the Site, a draft work plan entitled "Phase III Remedial Action Plan, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" (Phase III Remedial Action Plan) dated May 1988 and prepared by CRA was submitted to the USEPA and IDEM for review on August 15, 1988. The Phase III Remedial Action Plan addressed the final remediation of the Site including previously excavated soil and debris stockpiled on Site as well as in-situ soil, sediment and debris. Representatives of Battery Properties Inc., USEPA, IDEM, and CRA met to discuss the Phase III Remedial Action Plan on September 2, 1988. A revised work plan entitled "Phase III Removal Action Plan, Former P.R. Mallory Plant Site, Crawfordsville, Indiana", (Phase III RAP) dated September 1988 and prepared by CRA, modified to incorporate the changes requested by USEPA and IDEM during the review of the Phase III Remedial Action Plan at the September 2, 1988 meeting, was submitted to USEPA and IDEM on September 8, 1988.

Following submission of the revised Phase III RAP to the Agencies, Battery Properties Inc. developed a site operations plan to provide the basis for construction activities, sampling and analysis activities, and field quality control procedures. Details of the site operations plan are presented in a report entitled "Site Operations Plan, Phase III Removal Action, Former P.R. Mallory Plant Site, Crawfordsville, Indiana "(Phase III SOP) dated September 1988 and prepared by CRA, submitted to the USEPA and IDEM for review on September 14, 1988. IDEM responded with comments on the Phase III RAP and Phase III SOP by letter dated November 22, 1988. Battery Properties responded to IDEM's comments by letter dated January 2, 1989. IDEM subsequently agreed to the above-noted response, with the exception of the proposed cleanup criterion for the ravine sediment, by letter dated February 9, 1989. IDEM's letter dated February 9, 1989 required a cleanup criterion of 1 mg/kg PCBs for the ravine sediment.

2.2 WASTE MANAGEMENT ALTERNATIVES AND CLEANUP CRITERIA

The main component of the Phase III RA involved the excavation, removal and disposal of residually contaminated soil, sediment, and debris from the Site. Battery Properties evaluated cleanup alternatives available and applicable to current Site conditions including off-Site disposal, off-Site incineration, on-Site incineration and on-Site containment. Based on this evaluation, Battery Properties Inc. selected off-Site disposal as the preferred cleanup alternative for management of PCB-contaminated soil, sediment, and debris from the Site, on the basis of:

i) proven technology;
ii) protectiveness of human health and the environment;
iii) regulatory compliance;
iv) immediate availability for implementation; and
v) cost effectiveness.

Battery Properties Inc. proposed to dispose of PCB-contaminated soil and sediment, and debris suitable for landfilling, in a Toxic Substances Control Act (TSCA) regulated cell at a treatment/storage/disposal (TSD) facility currently in compliance with applicable local, State and Federal regulations.

Battery Properties Inc. proposed to dispose of hazardous and non-hazardous waste material, other than the material addressed above, in accordance with the following criteria:

i) PCB capacitors would be disposed of at a TSCA approved off-Site incinerator;

ii) non-hazardous waste including above-grade vegetation, and decontaminated/uncontaminated debris would be disposed of at a sanitary landfill;

iii) hazardous liquids would be treated and/or incinerated and disposed of off Site at a permitted TSD facility; and

iv) non-hazardous liquids would be transported off Site to an appropriate facility for treatment and/or disposal in accordance with applicable regulations. Treated wastewater from the on-Site wastewater treatment system classified as non-hazardous based on analytical results could be used for dust control in soil staging areas and/or areas where residually contaminated soil/sediment would be excavated, handled or loaded for disposal.

Battery Properties Inc. completed a review of current USEPA policies and cleanup criteria applied to other sites. Based on this review, the following tiered cleanup criteria were deemed appropriate and were implemented for materials to remain on Site; the cleanup criteria were presented in the Phase III RAP and approved by the USEPA and IDEM.

i) a maximum concentration of 10 mg/kg of total PCBs for all affected soils to a depth of 3.5 feet below the final restored grade, provided the soil was covered with a minimum 10-inch thick layer of clean soil;

ii) a maximum concentration of 25 mg/kg of total PCBs for all affected soils at a depth in excess of 3.5 feet below the final restored grade; and

iii) a maximum concentration of 10 mg/kg of total PCBs for the concrete plant slab.

The above criteria recognized the intent of the PCBs Spill Cleanup Policy and its practical application to the Site-specific conditions. Based on the excavation depths required to meet these criteria and the residual concentration of PCBs following cleanup, the tiered criteria provided a level of protection to the public equivalent to that provided by the Spill Cleanup Policy. The criteria transition depth of 3.5 feet represents the regional frost penetration depth which would be the maximum anticipated depth for foundations and services and therefore the maximum depth of disturbance for any anticipated future construction activities at the Site.

Materials disposed of off Site, including miscellaneous debris, rubble or structures, were sampled, as appropriate, to adequately characterize the material and were permitted to be disposed of in accordance with the criteria presented below:

i) miscellaneous metal debris, synthetic liners and new concrete structures with intact surfaces were wipe sampled and disposed of as follows:
   - materials with less than 100 μg PCBs/100 cm^2 in a sanitary landfill
   - materials with greater than 100 μg PCBs/100 cm^2 in a permitted TSD facility as specified for residually contaminated soil;

ii) miscellaneous concrete, rubble and debris which could not be wipe sampled due to surface porosity were sampled by other means and disposed of as follows:
   - materials with less than 25 mg/kg PCBs in a sanitary landfill
   - materials with greater than 25 mg/kg PCBs in a permitted TSD facility as specified for residually contaminated soil; and

iii) concrete rubble from the pumphouse and incinerator was disposed of in a permitted TSD facility as specified for residually contaminated soil.

2.3 LAYOUT OF EXCAVATION AREAS

CRA personnel mobilized to the Site on October 31, 1988 to commence layout and initial surveying of excavation areas. By November 4, 1988 layout of the majority of the excavation areas adjacent to the plant slab was completed, and personnel temporarily demobilized from Site.

3.0 PHASE III REMOVAL ACTION

3.1 GENERAL

The Phase III RA is considered to be the final cleanup phase at the Site. Activities performed during the Phase III RA included the removal and off-Site disposal of PCB-contaminated soil, concrete, debris, capacitors, excavation waters, wastewaters, and surface restoration of disturbed areas.

Following preparation of detailed plans and specifications for implementation of the Phase III RA, Kraft, Inc. retained Chemical Waste Management Inc. (CWM) of Palos Heights, Illinois to perform the works. All Phase III RA activities were carried out in accordance with the approved Phase III RAP, Phase III SOP, and previously approved QAPP.

Representatives of IDEM, CWM, CRA, and local Crawfordsville officials met on December 21, 1988 to review the proposed scope of work for the Phase III Removal Action and to discuss an off-Site contingency plan to be followed in the event of an emergency at the Site. Details of the off-Site Contingency planning meeting are presented in Section 3.8.3.

All construction activities were performed under the supervision and direction of CRA. The USEPA and IDEM shared oversight responsibilities during the Phase III Removal Action. Either a USEPA or IDEM representative was on Site during all major construction activities, including soil excavation, ravine sediment excavation, loading of trucks with contaminated material for off-Site disposal, surface restoration activities, borehole installations, and project demobilization.

3.2 SITE SAMPLING PROGRAM

Concurrent with the Phase III Removal Action, an extensive sampling and analysis program was undertaken at the Site in accordance with the approved Phase III RAP and Phase III SOP. The Phase III sampling and analysis program comprised the collection and analysis of investigative and confirmatory samples, from soil, concrete, excavation waters, and other wastewaters.

During mobilization and Site preparation activities, CRA performed additional investigative soil sampling in areas adjacent to Terra's building west of the Site security fence, and adjacent to the southwestern and southern portions of the plant slab on Site. Also, additional samples were collected from the driveway area to the west of Superior, and from the parking lot area to the north of Superior. The purpose of the investigative soil sampling was to further define the areal and vertical extent of PCB contamination at the Site.

As the Phase III Removal Action progressed, additional investigative soil samples were collected at locations along the slopes of the ravine to further define the areal limits of PCB contamination. In area D adjacent to Terra's facility, a series of boreholes were installed and investigative soil samples were collected at depth to determine the areal extent of PCB contamination beneath and adjacent to the building.

Following excavation of PCB contaminated soils to the initial proposed excavation depths, confirmatory soil samples were collected from the base of the excavations to confirm that cleanup criteria were achieved. During the majority of the Phase III Removal Action, soil samples were screened for PCBs in the on-Site mobile laboratory. In the event that the results of the PCB screening analysis indicated that cleanup criterion had not been achieved in an excavation area, additional excavation of the area was performed and the area was re-sampled. When the results of the PCB screening analyses confirmed that cleanup criterion was achieved in an excavation area, several samples from a common area were composited and the composite sample analyzed for PCBs by Contract Laboratory Program (CLP) protocols at Wadsworth/Alert Laboratories (hereafter WAL), North Canton, Ohio laboratory (WAL's corporate name changed to Enesco-Wadsworth/Alert Laboratories effective February 1993). The result of PCB analysis performed by CLP protocols on the composite soil sample was used as the determining factor as to whether the cleanup criterion was achieved in an excavation area. However, backfilling of excavation areas was performed based on the PCB screening results.

The initial proposed locations of the confirmatory soil samples are shown on Plan 2. The actual locations of the soil samples collected during the Phase III RA are shown on Plan 3. Details of the Phase III sampling and analysis program are presented in the Phase III SAR.

3.3 MOBILIZATION AND SITE PREPARATION

Mobilization of CWM personnel, material and equipment commenced on December 12, 1988.

Prior to mobilization, it was decided to locate the project command area and Clean Zone at the clean area inside the Site security fence at the northwestern corner of the Site, as shown on Plan 4, rather than outside the Site security fence to the northwest of the Site as proposed in the Phase III SOP.

Locating the Clean Zone at this location had the following advantages:

i) cross-contamination, if any, of clean areas of the Site would be minimized;

ii) truck traffic through contaminated areas of the Site would be eliminated, therefore minimizing the potential exposure of drivers to contaminated materials, and minimizing the risk of injury to other on-Site personnel from the truck traffic; and

iii) the loading of contaminated materials into trucks would be performed further away from State Road 32, therefore minimizing the potential exposure of the public to contaminated materials.

On December 14, 1988 and December 15, 1988 new Site access gates were installed in the northern and western sides of the Site security fence near the northwestern corner of the Site, as shown on Plan 4. Over the period of December 16, 1988 to December 22, 1988, CWM constructed a truck access roadway leading from Terra's parking area through the truck lining area to the Clean Zone of the Site, and extending to the truck loading area. The access roadway was constructed by placing and compacting approximately six inches of granular road base material and several inches of crushed limestone over a blanket of synthetic filter fabric.

In preparation for maintaining access for Superior to at least one of Superior's loading dock areas during excavation activities, at Superior's request, the former fire pond situated on the eastern side of Superior's facility was backfilled and leveled, and an access road constructed in its place. Prior to grading of the berms bordering the fire pond, a PVC liner covering the base and sides of the pond was removed. The berms were graded towards the center of the fire pond, and additional imported common fill material was placed to match existing grades adjacent to Superior's building. The access road was constructed by placing and compacting approximately six inches of granular road base material and several inches of crushed limestone over a blanket of synthetic filter fabric.

Between December 19, 1988 to December 21, 1988 two office trailers were delivered to the Site, and the installation of power and telephone services was completed. On December 22, 1988 a personnel decontamination trailer was mobilized to the Site and installed adjacent to the proposed location for the on-Site truck weigh scales.

On December 20, 1988 a crew from ICEP, sub-contractor to CWM, commenced construction of a concrete foundation for the on-Site truck weigh scales and a new concrete decontamination pad (hereafter, Phase III decontamination pad). A set of prefabricated 60-foot weigh scales were mobilized to the Site on January 10, 1989 and by January 25, 1989 were installed, calibrated, and ready for use.

The layout of the Clean Zone, Contamination Reduction Zone and all relevant Site features are shown on Plan 3.

CWM retained Roberts Security, of Lafayette, Indiana to provide security services on Site during non-working hours and during periods of temporary project shutdown, such as weekends or holidays. Security services were initiated on January 9, 1989 prior to dismantling portions of the Site security fence. Throughout the remainder of the Phase III Removal Action, a security guard was on Site at all times when other Site personnel were not present. In general, a security guard was present daily from 4:00 p.m. to 8:00 a.m. on working days, with 24-hour security on non-working days. Except on a limited number of occasions, work activities on Site were performed on Mondays through Saturdays. During a given shift security guards performed regular perimeter Site inspections from clean areas of the Site. No significant Site security issues arose during the Phase III Removal Action.

Due to the anticipated large number of soil samples to be analyzed from the Site over the duration of the Phase III Removal Action, WAL were retained to provide on-Site analytical services from an on-Site mobile laboratory. The on-Site laboratory was used to perform only the initial PCB screening analyses on confirmatory soil samples, prior to compositing for PCB analyses by CLP protocols at WAL's North Canton, Ohio laboratory. On Monday, January 30, 1989 the mobile laboratory was mobilized to the Site and located immediately outside the Site security fence to the north of the Clean Zone. Due to delays in obtaining an appropriate power supply, the mobile laboratory was not operational for the analysis of samples until February 7, 1989. Details pertaining to the operation of the on-Site laboratory, and the interaction between the on-Site laboratory and WAL's North Canton, Ohio laboratory are presented in the Phase III SAR.

Due to the significant quantity of potentially contaminated waters anticipated to be generated on Site during the Phase III Removal Action through removal of stormwaters from excavations and from the decontamination of trucks and equipment by pressure washing, an on-Site water treatment system, designed to remove low concentrations of

PCBs from the excavation and decontamination waters (hereafter, wastewaters), was installed at an area south of the Phase III decontamination pad, as shown on Plan 4. Initially, the treatment system consisted of a bag filter connected in series with two 55-gallon drums containing granular activated carbon (GAC). Wastewaters to be treated were initially transferred to a 23,000-gallon steel frac tank (wastewater feed tank), then pumped through the treatment system. The treated wastewater was then discharged to a 6,000-gallon polyethylene product tank for sampling and off-Site disposal. Following heavy rainfall during the winter months of 1989, the quantities of wastewaters to be removed from excavation areas increased substantially and it became necessary to install a larger wastewater treatment system in order to avoid slowdown of the project. In late March 1989 the two 55-gallon carbon adsorption drums were replaced with a larger adsorption unit containing approximately 2,000 pounds of GAC . In addition, a large 50,000-gallon modular product tank constructed of high density polyethylene (HDPE) liner with an aluminum frame, was mobilized to the Site to contain treated wastewaters. In addition, a second 23,000-gallon frac tank was installed to increase storage capacity for wastewaters prior to treatment. Following installation of the larger treatment system, the rate of wastewater treatment on Site was increased from approximately four gallons per minute to approximately ten gallons per minute.

CWM's deep well injection facility, located in Vickery, Ohio, was selected as the disposal facility for treated wastewaters from the Site. During the Phase III Removal Action, CWM's Vickery, Ohio facility was permitted to receive for disposal, wastewaters containing PCBs at concentrations of up to 5 milligrams per liter (mg/L). During the Phase III Removal Action, where detected, PCB concentrations detected in samples collected from the treated wastewater ranged from 0.7 micrograms per liter (μg/L) to 190 μg/L, therefore well within the 5 mg/L criterion applicable for disposal at the Vickery, Ohio facility.

Tanker trucks arrived on Site on an as-required basis to transport treated wastewaters to the Vickery, Ohio facility. Over the duration of the Phase III Removal Action, 294 tanker trailer loads, representing of total of 1,662,659 gallons of wastewaters, were disposed of at the Vickery, Ohio facility. A copy of the waste profile form, a sample copy of a completed bill of lading and a summary of the loads of wastewaters disposed of at CWM's Vickery, Ohio facility, are presented in Appendix A.

3.3 EXCAVATION AND REMOVAL ACTIVITIES

3.3.1 General

Excavation of contaminated soil and sediment was performed in two main areas of the Site; namely, areas adjacent to the concrete plant slab, and the ravine area extending from Superior's building downgradient to Little Sugar Creek. Excavation areas adjacent to the plant slab were identified as areas A, B, C and D, which were in turn divided into smaller sub-areas, and given an alpha-numeric identifier. The locations of the sub-areas are shown on Plan 2.

In addition, soil and debris previously excavated and stockpiled in the Phase I and Phase II interim storage cells and the lined soil stockpile at the northern portion of the Site, and the metal debris stockpiled in the debris contaminant cell during Phase II activities, were also excavated and removed from Site.

As detailed in the Phase III SAR additional concrete core and chip samples collected from the concrete plant slab indicated that much of the concrete plant slab was contaminated with PCBs at concentrations exceeding the 10 mg/kg cleanup criterion. Therefore, as detailed in Section 3.3.3.5, the concrete plant slab was excavated and disposed of with the PCB contaminated soils from the Site.

3.3.2 Truck Loading and Off-Site Disposal

Concurrent with soil excavation activities, excavated material was loaded into semi-trailers for off-Site disposal, from a large soil stockpile located immediately south of the truck weigh scales. The truck loading area is shown on Plan 4.

Upon arrival at the Site, semi-trailers were directed into a truck lining station where the trailer beds were lined with 3-mil polyethylene sheeting. The purpose of lining the trailer bed prior to loading was to minimize contamination of the trailer bed and also to allow loaded material to slide out of the trailer more easily when unloading at the disposal facility. Following lining, trucks proceeded from the lining station to the on-Site weigh scales where the tare weight of the truck was recorded.

A large Link Belt LS-4300 trackhoe situated on a platform of contaminated soil between the soil loading stockpile and the weigh scales, was used to load the trucks. Trucks remained on the weigh scales throughout loading, until the maximum allowable travel weight for the truck and trailer was reached. In most cases, seven or eight buckets of soil from the trackhoe bucket were loaded into the trailer before the trailer was loaded to its maximum travel weight. On average, approximately 23 tons of material were loaded into each truck. Following loading, the truck tarps were rolled back and secured with rubber ties to cover the loaded material. Throughout the loading process truck drivers were required to wear air-purifying respirators, and remain in the truck cabs with the windows rolled up.

From the weigh scales trucks proceeded directly onto the newly constructed concrete Phase III decontamination pad. At the decontamination pad a high-pressure water spray unit was used to wash the tires and sides of the loaded trucks and trailers. Wash waters drained to a sump in the decontamination pad, and subsequently were pumped to the on-Site water treatment facility for treatment.

Trucks then proceeded off the decontamination pad and stopped along the driveway area adjacent to the water treatment facility. Here, truck drivers removed their air-purifying respirators and were able to leave the truck cabs. Drivers secured the trailer tarps and placed the appropriate PCB waste identification stickers and 9188 placard codes on the trailers, in accordance with applicable regulations. CWM personnel prepared and signed a Uniform Hazardous Waste Manifest form and weigh ticket for each load and provided a copy of each to the truck driver to accompany the load to the disposal facility.

The TSCA-regulated cell at CWM's chemical waste landfill located in Emelle, Alabama was selected as the disposal Site for all solid materials contaminated with PCBs at concentrations above the appropriate cleanup criteria for the Site. The distance from the Site to CWM's Emelle, Alabama facility was approximately 685 miles each way, and took drivers returning back to the Site approximately 40 hours to complete the round trip. Over the duration of the Phase III Removal Action, 3,660 semi-trailer loads and three lugger box loads, totaling 84,624.57 tons of contaminated soil, concrete and debris, were disposed of at CWM's Emelle, Alabama facility. A copy of the waste profile form, a sample copy of a completed Hazardous Waste Manifest form and a summary of the loads of PCB-contaminated solid materials disposed of at CWM's Emelle, Alabama facility during the Phase III RA, are presented in Appendix B.

3.3.3 Excavation of Areas Adjacent to the Former Plant Slab

3.3.3.1 General

Prior to commencing excavation of contaminated areas outside the limits of the Site security fence, temporary snow fencing was erected around the outlying areas, to define temporary Exclusion Zones and to extend the limits of the main Exclusion Zone. The temporary fencing also prevented unauthorized entry to the contaminated areas. To provide construction equipment and on-Site personnel with adequate access to the areas from the Exclusion Zone, the Site security fence was sequentially dismantled, as necessary.

In most areas adjacent to the plant slab a Link Belt LS-3400 trackhoe was used to excavate areas to the initial excavation depths. However, in several areas a smaller Caterpillar 205 trackhoe was used for excavation to avoid contact with low hanging telephone and power wires. A steel plate was welded across the teeth of the trackhoe bucket, to provide a smooth excavation surface. Initial excavation depths for each excavation area are shown on Plan 2.

Following excavation of an area to the initial excavation depth, confirmatory soil samples were collected from the excavation surface in accordance with the approved Phase III RAP and Phase III SOP, and as outlined in Section 3.2. Following collection, soil samples were submitted to the on-Site laboratory for PCB screening analyses, to determine if cleanup criteria had been achieved. Based on the analytical results received for the confirmatory soil samples, the excavation sub-areas were either backfilled with clean material, or alternatively, additional excavation of the sub-area, followed by re-sampling of the excavated surface, was performed.

If additional excavation was required in order to achieve the cleanup criterion, the thickness of the additional layer of soil excavated was determined based on the residual PCB concentration in the sample(s) where the cleanup criterion was exceeded. Re-excavation was usually performed in increments of six to twelve inches, however, on a number of occasions when analytical results indicated that elevated concentrations of PCBs remained in the soil following several excavations of an area, two to three feet of material was removed. Additional excavation and sampling was performed in this manner until sample analyses indicated that the cleanup criterion was achieved.

The confirmatory soil sample locations are shown on Plan 3. The final excavated contours of the excavation areas are shown on Plan 5.

The excavation activities performed in each of areas A, B, C, D, and E (ravine area), are discussed in the following sections.

3.3.3.2 Excavation Area "A"

Phase III Removal Action excavation activities commenced on January 12, 1989, in area A3. The Site security fence extending through area A6 was dismantled to provide access to the area for equipment and personnel. Area A3 was excavated to the initial excavation depth of 1.5 feet using the LS-3400 trackhoe. Excavated soil was placed in a temporary stockpile in area A4, where it was removed using a Caterpillar 973 trackloader and transported through areas A4, A6 and area D inside the Site security fence and stockpiled at the loading area located immediately to the south of the truck weigh scales.

In general, excavation activities in area A proceeded from west to east. Excavated material was placed in a temporary stockpile on the unexcavated ground adjacent to the trackhoe. The Caterpillar 973 trackloader then removed and transported the material through area D to the truck loading area adjacent to the truck weigh scales. Several sub-areas within area A required re-excavation to achieve the cleanup criterion, however, final excavated depths were, in most cases, similar to the initial excavation depths proposed.

Upon achieving the required cleanup criteria based on the PCB screening results, excavated areas in area A were backfilled with a coarse sandy road base material, as described in Section 3.4.2 and the surface restored with a layer of crushed stone.

3.3.3.3 Excavation Area "B"

Following completion of excavation activities in excavation area A, on January 29, 1989, excavation of area B adjacent to State Road 32 commenced.

Excavation commenced at the eastern limit of area B2 and proceeded west through area B3 to the eastern portion of area B1. The small Caterpillar 205 trackhoe was used for excavation in much of this area due to the close proximity to State Road 32 and overhead power and telephone wires. As excavation proceeded from the western limit of area B1 adjacent to Terra's driveway towards the eastern portion of area B1 excavated material was stockpiled behind the trackhoe, where it was removed and transported by the trackloader through area D west of the plant slab to the truck loading area.

During excavation of area B3, three buried pipes were encountered, as shown on Plan 6. Upon excavation it was determined that Pipe 7B was a piece of fill material, presumably deposited during original grading operations around the plant site.

Pipe 8 continued to extend at a slight upward gradient towards the northwest. The pipe was excavated towards the southwestern corner of the former loading dock adjacent to the plant slab, until it was determined that the pipe was not a drain pipe from the former loading dock drain. PCBs were not detected in soil samples collected from the base of the pipe trench excavation nor from the pipe bedding material existing directly beneath a joint in the pipe. In addition, PCBs were not detected in either of two wipe samples collected from the invert of the pipe. It was therefore determined that Pipe 8 was not associated with drainage from the former P.R. Mallory plant, but was likely a stormwater drain pipe discharging from one of Terra's buildings. The invert of the pipe was visually clean with no visible staining, and was free of sediment. The remaining section of pipe, which appeared to continue to extend in a northwesterly direction, was sealed with grout at the termination of the pipe excavation adjacent to the southwestern corner of the former plant loading dock, and the pipe trench was backfilled with clean imported material.

Pipe 7 extended towards the northeast through area D36, and was excavated from southwest to northeast, as detailed in Section 3.3.3.4.

In general, excavation of area B was completed without difficulty, however much of area B1 required re-excavation several times before cleanup criteria were achieved. Excavation activities in area B were completed by February 6, 1989, however backfilling of this area could not be completed until mid-March 1989 due to adverse weather conditions.

3.3.3.4 Excavation Areas "C" and "D"

Based on analytical data obtained from split-spoon soil samples collected to the north and west of Superior's building in early January 1989, initial excavation of a nominal one-foot of material was required over all areas previously indicated in the Phase III RAP as being "on hold" pending further sampling and analysis.

Excavation of area C commenced on January 19, 1989 in area C6, overlying two underground diesel fuel storage tanks located adjacent to the southwestern corner of Superior's building. The underground tanks were owned and operated by Superior. Excavation of a surficial ten inches of material from area C6 was performed with extreme care, to avoid impacting the underlying tanks. Excavation of material immediately adjacent to the tank filler pipes and vent pipes was performed manually using hand shovels.

Excavation of area C continued towards the west to area C2, and towards the north to areas C5 and C1. In addition, concurrent with the excavation of areas C1, C2, and C5, due to the close proximity of areas D26, D27, D28 and D29, these areas were excavated to the west to the Phase I decontamination pad and concrete plant slab. As excavation proceeded, an abandoned subsurface natural gas line which formerly provided natural gas to the plant facility, was excavated and removed. The gas line had, in previous years, already been disconnected from service. The gas line had extended in a north-south direction, along the eastern limit of the concrete plant slab to State Road 32. Following removal of the gas line, confirmatory soil samples were collected from the pipe bedding material to ensure that PCB contamination from the overlying soil had not migrated deeper into the soil along the length of the pipe. In several areas, excavation of pipe bedding material was required.

Due to cold temperatures and frequent snowfalls, conditions were not suitable for backfilling the completed excavation areas to the west of Superior until early March 1989. Approximately six inches of coarse road base material was backfilled into the clean area C excavation areas to the west of Superior, and where possible, into excavation areas D28, D29 and D26. Following placement of the road base material, approximately six to nine inches of crushed stone was placed over the surface, to restore the area to approximately pre-excavation elevations.

In order to minimize disruption to Superior's operations during excavation of the remaining portion of area C, access to at least one of Superior's loading dock areas on the north side of their building was maintained at all times. In cooperation with Superior, it was agreed that excavation and backfilling activities would be completed over the western portion of Superior's parking area, prior to commencing excavation of the eastern portion of the parking area. By proceeding in this manner, Superior maintained vehicular access to their easternmost loading dock, by the driveway constructed at the location of Superior's former fire pond area during Site preparation activities.

A portion of the Site security fence adjacent to area D35 was dismantled, and clean surficial stone and backfill previously placed in the area north of area D35 which was lined with a HDPE liner during Phase II remedial activities, was removed and placed in a stockpile on the clean area further to the north, to be used as backfill later. Following removal of the clean surficial stone and clean backfill material, this area served as a travel path for contaminated equipment and personnel, between the truck loading area and the excavation areas in the western portion of Superior's parking lot. To extend the limits of the Exclusion Zone, CWM erected temporary snow fencing extending north from Superior's building towards sub-area C4C, then northwest towards sub-area D25E and west to tie into the Site security fence at the northern limit of area D35.

On January 25, 1989 excavation of area C3 adjacent to Superior's loading dock commenced. Excavation proceeded to the west and north in portions of areas C5, C4, D25, D26 and D35. While excavating in sub-area C3D, a small refuse area approximately ten feet wide by ten feet long was exposed. In this area a number of crushed building bricks and small pieces of scrap metal debris were uncovered. The bricks and debris were determined to extend to a depth of approximately four inches below the initial 1-foot depth of the excavation, and were completely excavated and removed.

During excavation activities in sub-area D25C, Pipe 1 was excavated and removed. This pipe was previously located during Phase II activities, and originated at the plant slab. As Pipe 1 was excavated towards the southwest through area D26, several additional subsurface pipes were exposed in the trench, as shown on Plan 6. Excavation of Pipes 2, 4, 5, 9 and 10 and an underlying approximately one foot of material was performed as the pipes were exposed. Excavation of the pipes continued to the northeast to the limit of surface excavation at area D25. Through excavation, it was determined that another pipe existed beneath Pipe 1 in the same trench. Pipes 1, 2, 4, 5 and 9 appeared to extend further to the northeast to the ravine area. These pipes were temporarily plugged with cement grout to prevent the infiltration of water, until these portions of the pipes were excavated and removed later in the project concurrent with excavation activities in the ravine area, as detailed Section 3.3.3.6.2.

The pipes were excavated to the southwest and west towards their origins at the plant slab, as shown on Plan 6. Several pipe trenches required re-excavation one or more times before the cleanup criterion was achieved, due to residual PCB contamination in the material underlying the pipes.

Following achieving the cleanup criterion in the pipe trenches and surrounding surface areas, the areas were backfilled with clean material and restored to approximately pre-excavation elevations. Prior to backfilling several of the pipe trenches standing water which had accumulated through snow melt was removed. The water removed was transferred to the on-Site treatment facility for treatment.

Following several repeated excavations in areas D35 and D26F, soil samples collected from the excavation surface contained elevated concentrations of PCBs. At an excavation depth of approximately 11 feet below grade in sub-area D35B, a sand pocket containing a reddish brown colored oily liquid was observed. Prior to removal of the sand pocket a sample of the oily liquid was collected. To determine if the liquid was contaminated with PCBs, a sample of clean imported backfill material was "spiked" with the liquid and the sample was submitted to the on-Site laboratory for PCB analysis. Results of the analysis indicated that the spiked sample contained PCBs at a concentration of 38,000 mg/kg, therefore indicating that the oily liquid was likely PCB-contaminated waste oil. Through excavation, it was determined that the oily sand pocket was very localized, and extended only approximately six inches in depth.

Excavation of areas D26F and D35 continued downwards in increments of approximately one to three feet. The cleanup criterion was achieved in sub-area D26F at an excavation depth of approximately seven feet below grade. As excavation continued in area D35 a sand pocket saturated with water which appeared to contain small droplets of a brownish yellow oil, was observed in the excavation face at the northeastern corner of sub-area D35C. The sand pocket was approximately five feet in diameter. A soil sample collected from the sand pocket contained PCBs at a concentration of 38,000 mg/kg.

Due to the considerable depth of the excavation in area D35, approximately 11 feet below grade, additional soil samples were collected from the northern, eastern, and western sidewalls of the excavation; samples collected from sub-area D26F previously demonstrated that the southern sidewall met the cleanup criterion. Analytical results from the sidewall soil samples indicated that additional excavation of the eastern and western sidewalls was required.

During the month of April 1989, excavation of the eastern sidewall of area D35 was extended approximately 18 feet further to the east before the cleanup criterion was achieved. Excavation of the contaminated sand pocket located in the northeastern corner of the excavation proceeded an additional approximately 10 feet to the northeast, before the cleanup criterion was achieved. During additional excavations of the sand pocket, results of soil samples collected from the sand pocket indicated that PCB concentrations in the sand pocket decreased from 38,000 mg/kg to non-detectable concentrations, where excavation was terminated. After achieving the cleanup criterion in the sand pocket, excavation activities were completed along the base of the D35 excavation area and the western excavation sidewall. The cleanup criterion was achieved along the base of the excavation at a depth of approximately 18 feet below grade. Excavation of area D35 was completed by early May 1989.

Backfilling of area D35 was performed by constructing a clean access ramp extending through sub-area D26F into area D35. Trucks delivering backfill to the Site were able to proceed partially down the ramp to unload clean material. A small Caterpillar D4 bulldozer was used to spread the clean fill material into the excavation, and a Dresser compactor was used to compact the fill material.

Concurrent with the excavation activities in area D35, excavation was performed in areas D26, D27, D29 and D34 adjacent to the Phase I decontamination pad and the eastern portion of the plant slab. During excavation of area D29 a buried pipe extending from the southeastern corner of the plant slab was exposed. The pipe was excavated approximately 15 feet towards the southeast, where it was observed to branch off at a "T" joint. One branch of the pipe extended to the north underneath the Phase I decontamination pad, and the other branch extended towards the southwest.

The decontamination pad was pressure washed, then dismantled using the trackhoe. The concrete rubble from the decontamination pad was temporarily stockpiled at a pre-cleaned location in the Phase II interim storage cell. Surface wipe samples collected from the surface of the concrete rubble contained PCBs at concentrations ranging from 1 microgram per 100 square centimeters ($\mu g/100\ cm^2$) to 9.4 $\mu g/100\ cm^2$, therefore within the criterion for off-Site disposal at a sanitary landfill.

Following excavation of the Phase I decontamination pad, excavation of Pipe 7, previously excavated in area B, continued towards the north. The pipe was excavated to where it terminated approximately 60 feet north of the Phase I decontamination pad.

Following excavation of the Phase I decontamination pad PCB screening results from soil samples collected from the underlying soil surface indicated that additional soil excavation was required to achieve the cleanup criterion. During excavation in this area what appeared to be two ports of an underground tank were exposed. The tank was constructed of concrete and contained a grayish watery liquid. The liquid in the tank was sampled, and submitted for analyses for PCBs, volatile organic compounds (VOCs), specific conductivity, and pH. The liquid, totalling approximately 1,300 gallons, was pumped to a polyethylene storage tank on Site, while awaiting receipt of the analytical results and an assessment of disposal options.

Analytical results received from samples collected from the tank indicated that the liquid contained PCBs at a concentration of 560 μg/L. In addition, 1,2-dichloroethene and trichloroethene were detected at concentrations of 4,100 μg/L and 350 μg/L, respectively. Due to the presence of VOCs in the liquid it was determined that the liquid should be removed from Site and disposed of by incineration. However, due to a misunderstanding between Site personnel, the liquid was inadvertently transferred to the on-Site water treatment facility and treated. Analytical results from treated wastewater samples collected from the effluent of the treatment system indicated that the treated wastewater contained a low concentration of trichloroethene. However, since the concentration of trichlorethene present in the wastewater was within acceptable limits for off-Site disposal at the Vickery, Ohio facility, separate profiling and disposal of the wastewater was not required.

Following removal of the pumpable liquid from the tank, approximately one foot of sludge remained at the tank base. Upon performing additional excavation to remove the tank, it was observed that in fact, two concrete tanks existed, located immediately adjacent to each other. The tanks were demolished in place and removed, however, the underlying soil and sludge mixture was too wet to excavate efficiently. A hopper load of kiln dust was imported to the Site to solidify the wet sludge. A trackhoe was then used to mix the kiln dust into the sludge, and the material was solidified to a consistency suitable for excavation. The material was excavated to a depth of approximately ten feet below grade, and PCB analytical results received from a soil sample collected from the base of the excavation confirmed that the cleanup criterion was achieved.

The former steel hydraulic lift unit located adjacent to the southeastern corner of the plant slab was also excavated, leaving an excavation approximately 12 feet in diameter and 10 feet deep. A soil sample was retrieved from the base of the excavation, and results of PCB analysis performed on the sample confirmed that the area met the cleanup criterion. Prior to backfilling the excavation, the trackhoe accidentally punctured the side of a 6,000-gallon polyethylene water storage tank temporarily situated on the southeastern corner of the concrete plant slab. The polyethylene tank had been filled with untreated excavation water removed from various excavations. A portion of the wastewater from the punctured tank discharged onto the southeastern corner of the plant slab, however, the majority of the wastewater drained into the excavation from the former hydraulic lift. When additional temporary tankage became available, the wastewater was pumped from the excavation, and the excavation surface was scraped and re-sampled. The results of the PCB analysis performed on the soil sample again confirmed that the cleanup criterion was achieved, and the area was immediately backfilled. Prior to backfilling, the base of the excavation was approximately 11 feet below grade.

Excavation of remaining portions of area D east of the southern two-thirds of the plant slab proceeded without major difficulty. All subsurface pipes were excavated and removed along with approximately one foot of bedding material beneath the pipes, as excavation proceeded.

Excavation of area D continued from the western portion of area D36 north to area D5. In addition, areas D31 and the western portion of area D30 adjacent to the southern portion of the slab were excavated.

On February 10, 1989, following approximately three weeks of excavation and confirmatory sampling activities, the first data packages of CLP composite PCB analytical results from the investigative soil samples collected during mobilization activities were received from WAL.

Based on a review of the CLP analytical data, it was apparent that a number of the CLP composites of the investigative soil samples contained higher concentrations of PCBs than the PCB concentrations of the individual sample aliquots as determined by the PCB screening analyses. Further, because the CLP composite results indicated that surficial soils in a number of the composite areas contained PCBs at concentrations greater than or equal to 1 mg/kg (and therefore required a minimum of 10 inches of overlying clean fill material), excavation of these areas was required. Specifically, these areas comprised areas A2, A5, C5, the eastern portion of areas D36 and D30, and several areas in the parking area north of the Superior's building.

Due to the discrepancies observed between the analytical results received from the PCB screening analyses and the PCB analyses performed by CLP protocols on the investigative samples, expedited receipt of results of the PCB analyses performed by CLP protocols on composites of confirmatory soil samples prepared was requested. A review of the analytical data received indicated that the CLP composite sample representative of excavation area A7, which had been backfilled with clean imported material, contained PCBs at concentrations exceeding the cleanup criterion and therefore excavation was required in this area.

A thorough investigation as to the cause of the discrepancies between the CLP composite data and the individual sample aliquot screening data was performed. High clay-content soils such as found in some areas of the Site may exhibit a relatively high water content and hamper the efficient extraction of PCBs using hexane (a hexane extraction procedure is typically used for the SW-846 Method 8080 of PCB analysis). Following discussions with WAL and performing laboratory bench-scale testing, it was determined that a modified SW-846 extraction procedure, which employed the addition of acetone to deflocculate the clay particles of a soil sample, would allow a more effective hexane extraction of PCBs. Consequently, this extraction procedure was used when analyzing PCB soil samples during the remainder of the Phase III RA. Based on CLP composite data received later during the project, it was confirmed that the modified SW-846 sonication extraction/analyses method and the CLP composite analyses yielded consistent results.

Concurrent with the excavation of area D35, as discussed previously, excavation of area D12 and the eastern portion of area D13 was also performed. Excavation of sub-areas D13I through D13N to the initial excavation depths of two feet yielded sample results within the cleanup criterion. The former plant incinerator structure located near sub-area D13J and which was of concrete cinder block construction, was demolished and disposed of with the contaminated soil from the Site. During excavation in the northern portion of area D12, miscellaneous scrap metal, burned lumber, and capacitors were exposed at a depth of approximately four feet below grade. This debris had previously been located during Phase II activities performed at the Site, while excavating test pits for the delineation of underground pipes.

In the central and eastern portion of area D12, the debris extended to a depth of approximately six feet. Due to the void spaces within the buried debris, several hundred gallons of groundwater had accumulated within the debris. The water was a grayish color, likely due to the charred lumber debris. The water was pumped to drums, and temporarily staged next to the excavation.

Following excavation of the northern one-third of area D12 to the initial excavation depth of approximately 4.5 feet, PCB screening results from soil samples collected from the base of the excavation indicated that the cleanup criterion was achieved. Over the southern two-thirds of the excavation, the soil existing beneath the debris was observed to be comprised of what appeared to be clean native brown clay, and greenish gray stained clay. Several localized excavations, extending to depths of up to approximately eight feet below grade in places were required before the cleanup criterion was achieved.

Excavation activities in area D west of the concrete plant slab proceeded to the north as far as area D5 without major difficulties, and were largely completed by the end of February 1989. Excavation of the initial six feet of material from area D6 was completed on February 10, 1989. PCB screening results from soil samples collected from the excavation surface indicated that the cleanup criterion was achieved in sub-areas D6A and D6B, however PCBs were detected at a concentration of 4,200 mg/kg in sub-area D6C. Following excavation of an additional approximately 2.5 feet of material from sub-area D6C and part of sub-area D6B, the base of area D6 was re-sampled, and PCB screening results indicated that the base of the excavation was contaminated with PCBs at concentrations of several thousand milligrams per kilogram. Due to the considerable depth of PCB contamination detected along the excavation base, additional soil samples were collected from the excavation sidewalls in order to determine the areal extent of PCB contamination at depth. Results of the PCB screening analysis performed on the samples indicated that the western and southern excavation sidewalls did not contain PCBs at concentrations exceeding the cleanup criterion, however, the northern and eastern excavation sidewalls contained elevated concentrations of PCBs.

Excavation proceeded downwards in lifts of several feet. In order to facilitate excavation of material at this depth, it was necessary to excavate a tiered platform for the trackhoe adjacent areas D9 and D2. At a depth of approximately 14 feet below grade, a water-saturated sand and gravel seam was encountered. Tiny droplets of brownish yellow colored oily liquid were observed in the water-saturated seam, and soil samples collected from the sand contained PCBs at concentrations of up to several thousand milligrams per kilogram. The sand seam was approximately two feet in thickness, and was underlain by a gray hard pan material. In almost all cases, soil samples collected from the hard pan either did not contain detectable concentrations of PCBs, or contained very low PCB concentrations, well within the cleanup criterion. The entire surface of area D6 was excavated down to the hard pan material, approximately 17 feet below grade, where the cleanup criterion was consistently achieved. Soil samples were collected from the water-saturated sand seam exposed on the sidewalls of the excavation. Residual PCB contamination detected in the sand seams in the southern and western sidewalls was below the cleanup criterion, however, samples from the northern and eastern sidewalls contained PCBs at concentrations of several thousand milligrams per kilogram.

As excavation activities in area D6 continued towards the east, and additional tiered excavation platforms were constructed, an underground concrete tank was encountered several feet below the ground surface at sub-area D2E, as shown on Plan 6. The tank was approximately six feet long, four feet wide, and five feet deep. Two 3-inch diameter pipes extended from the eastern and western sides of the tank. The tank contained several feet of liquid.

The pipe on the eastern side of the tank originated from beneath the concrete plant slab. The pipe on the western side of the tank extended several feet west from the tank towards area D6, and appeared to end. It is possible that the pipe extending from the western side of the tank may have been connected to Pipe 12 extending north from the former plant loading dock area, however, the pipe extending from the tank appeared to be several feet higher in elevation. A connection between the two pipes could not be visually confirmed because Pipe 12 had previously been excavated and removed from the area. A weeping tile bed was not observed in the vicinity of the tank.

During excavation in the immediate vicinity of the tank, the eastern side of the tank was accidentally punctured with the trackhoe bucket. Approximately 150 gallons of grayish watery liquid leaked into a small excavation on the eastern side of the tank. The liquid was immediately bailed from the excavation using pails, and transferred to drums to be sampled and characterized for disposal. The upper portion of the tank was removed, and additional liquid remaining in the tank was bailed and transferred to drums. The lower portion of the tank and approximately one foot of underlying soil was excavated. PCB results received from a soil sample collected from the base of the excavation confirmed that the cleanup criterion was achieved.

Additional excavation of the eastern and northern sidewalls of area D6 was temporarily discontinued in mid-March 1989 in order to maintain construction vehicle access to the plant slab area. Backfilling of the portions of area D6 where the cleanup criterion was achieved was performed, where possible, to minimize the amount of water which would collect in the area from precipitation or snow melt.

Between February 7, 1989 and May 9, 1989, concurrent with excavation activities being performed in areas C and D, contaminated soil, drummed capacitors, and drummed and bagged miscellaneous waste materials and debris were removed from the Phase I and Phase II interim storage cells and other locations on or adjacent to the concrete plant slab. Specifically, the materials contained within the Phase I and Phase II interim storage cells included the following:

i) approximately 1,700 c.y. of PCB contaminated soil;

ii) 19 drums of capacitors;

iii) 27 drums containing soil cuttings from the installation of the monitoring wells at the Site.

iv) 14 drums containing sediment removed from the Phase I decontamination pad;

v) 31 drums and approximately 50 garbage bags containing used personal protective equipment;

vi) three drums containing used oil absorbent booms and miscellaneous solid debris;

vii) 18 drums containing well development waters from the installation of the monitoring wells at the Site; and

viii) two drums containing spent solvents (acetone, 1,1,1-trichloroethane, hexane, methanol) and deionized and distilled water from the decontamination of soil sampling equipment and monitoring well sampling equipment.

The contaminated soils, as well as the HDPE cell overliners, were removed from the Phase I and Phase II interim storage cells and transported to the truck loading area for disposal with the other contaminated soils from the Site. During the removal of soil from the Phase I interim storage storage cell, which contained miscellaneous capacitor debris and a number of intact capacitors intermixed with the soil, any intact capacitors observed were collected and placed in drums to be disposed of by incineration off Site. Intact capacitors were removed from the soil by Site personnel using hand shovels, and were placed directly into drums. Several additional drums of capacitors were filled during the removal of soil from the Phase I interim storage cell. The drummed capacitors were consolidated, comprising a total of 23 drums. The drummed capacitors were temporarily staged in a polyethylene-lined and bermed area constructed on the clean fill material to the southwest the Phase I interim storage cell, prior to removal from Site. On July 10, 1989, the 23 drums of capacitors were removed from Site for disposal by incineration at CWM Chemical Services, Inc., a TSCA-compliant incinerator located in Chicago, Illinois. A copy of the waste profile form and the completed Uniform Hazardous Waste Manifest form for the disposed capacitors are presented in Appendix C.

The soil cuttings, decontamination pad sediment, used personal protective equipment, used oil absorbent booms and miscellaneous solid debris were emptied from the drums and disposed of with the contaminated soils from the Site.

The drummed well development waters were removed from the drums and transferred to the on-Site water treatment system and treated with the other wastewaters from the Site.

The two drums containing decontamination solvent wash waters from the Phase I and Phase II activities at the Site, along with an additional drum of decontamination solvent wash waters generated during the Phase III Removal Action sampling activities were sampled and characterized. On July 10, 1989 the three drums of decontamination solvent waste water were removed from Site along with the drummed capacitors, for disposal by incineration at CWM Chemical Services, Inc. A copy of the waste profile form and the completed Uniform Hazardous Waste Manifest form for the solvent wash waters are presented in Appendix D.

In addition to removing contaminated soil and drummed and bagged waste materials from the interim storage cells and plant slab area, miscellaneous scrap metal staged in the HDPE lined debris containment cell during Phase II activities at the Site was removed and transported to the truck loading area to be disposed of off Site with the contaminated soils. In addition, the HDPE liner material and several pieces of wooden curbing used to construct the containment pad where wastewater tanker trailers were temporarily staged during the Phase II activities, were removed and transported to the truck loading area.

Two steel lugger boxes previously mobilized to the Site during the Phase I activities were pressure washed and given to Superior for general garbage storage. The lugger boxes had not previously been used to store PCB-contaminated materials, but rather, had been used to store visually clean lumber and debris from the construction of the interim storage cells.

3.3.3.5 Excavation of Plant Slab and Interim Storage Cells

On January 27, 1989 and March 1, 1989, concrete core samples were collected from the southern approximately one-half of the plant slab. ATEC were retained to perform the concrete coring operations. Details of the core sampling activities are presented in the Phase III SAR. In general, however, at each core location, samples were collected from the upper one-inch of concrete, the lower approximately four to six inches of concrete, and from the soil existing immediately beneath the slab.

Based on a review of the PCB analytical data obtained from the concrete and soil samples collected, it was apparent that PCB contamination existed at varying concentrations in both the concrete plant slab and the soil existing immediately beneath the plant slab. PCB contamination was determined to exist in the concrete plant slab, at various locations, both at concentrations above and below the cleanup criteria applicable to off-Site removal, and also above and below the cleanup criteria stipulating whether the concrete would require disposal at a TSCA-permitted facility or at a sanitary landfill. Due to concern about the ability to accurately and completely define areas of the concrete plant slab which could be disposed of at a sanitary landfill, or alternatively, which could be left in place, it was decided to excavate and remove the entire concrete slab, for disposal with the contaminated soil from the Site at CWM's TSCA-permitted hazardous waste landfill located in Emelle, Alabama.

On April 1, 1989 excavation of the southwestern corner of the plant slab commenced. Excavation of the plant slab was performed using the LS-3400 trackhoe. Due to the practical limitations associated with removing and decontaminating the synthetic liner formerly installed over the southwestern portion of the plant slab during the Phase II activities, the liner was removed and disposed of off Site at CWM's Emelle, Alabama facility.

During the initial plant slab excavation the concrete slab and underlying approximately three to six inches of sand were removed. Beneath the sand bedding existed a layer of compacted crushed stone approximately two inches to three inches in thickness, underlain by what appeared to be native clay. Two samples of the crushed stone layer existing beneath the southwestern corner of the plant slab contained PCBs at concentrations of 17 mg/kg and 72 mg/kg, however, PCBs were not detected in a sample collected from the clay material underlying the crushed stone. Based on these results, it was decided to excavate the underlying sand and crushed stone layers as the concrete plant slab was excavated.

Excavation of the southern one-half of the concrete slab proceeded expeditiously, with only the soils beneath the eastern portion of the slab requiring re-excavation to achieve the cleanup criterion. The majority of the concrete slab did not contain reinforcing bars or mesh, and was easily excavated by the trackhoe. A steel plate welded across the teeth of the trackhoe bucket produced a smooth excavation surface for sampling. A number of buried pipes were located beneath the concrete slab, and were removed as excavation proceeded. Several of the pipe trenches required re-excavation in order to achieve the cleanup criterion.

Following excavation of the plant slab confirmatory soil samples collected from locations immediately adjacent to the concrete footings associated with the slab indicated that the 10 mg/kg PCB cleanup criterion was achieved. Accordingly, since the analytical results from the soil samples collected adjacent to the footings were deemed representative of the level of PCB contamination within the concrete footings, the concrete footings were left in place over much of the southern portion of the plant slab. At locations of the plant slab where the underlying soils were excavated to significant depths, the concrete footings were removed and disposed of with the contaminated soils.

Following removal of the contaminated soil stockpiled in the Phase II interim storage cell during Phase II activities, the concrete surface of the cell was pressure washed to remove residual soils. A series of wipe samples and concrete chip samples collected from the surface of the cell indicated that, with the exception of one localized area, residual PCB concentrations remaining in the concrete were less than the 25 mg/kg (for bulk samples) and 100 $\mu g/100\ cm^2$ (for wipe samples) criteria applicable for off-Site disposal at a sanitary landfill. More specifically, with the exception of the one sample collected from the northwestern corner of the cell, where PCBs were detected in the concrete at a concentration of 27 mg/kg, the remaining concrete chip samples collected contained PCBs at concentrations ranging from 1 mg/kg to 10 mg/kg. The wipe samples collected from the concrete surface of the cell contained PCBs at concentrations ranging from 0.9 $\mu g/100\ cm^2$ to 13 $\mu g/100\ cm^2$. Following re-cleaning of the northwestern portion of the cell by pressure washing, two additional concrete chip samples were collected from the re-cleaned area. PCBs were detected in the chip samples at concentrations of 2 mg/kg and 7 mg/kg, therefore, within the 25 mg/kg criterion for off-Site disposal at a sanitary landfill.

During excavation of the Phase II interim storage cell concrete, the 60-mil HDPE cell underliner formerly installed on the concrete plant slab partially adhered to the cell concrete and mixed with the concrete rubble. Since the underliner had been in direct contact with the underlying plant slab and, therefore, could have potentially been contaminated with PCBs, wipe samples were collected from the undersurface of the liner to confirm that the liner was not contaminated with PCBs at concentrations exceeding the 100 $\mu g/100\ cm^2$ criterion applicable for off-Site disposal at a sanitary landfill. Analytical results received from the wipe samples indicated that the samples contained PCBs at concentrations ranging from 17 $\mu g/100\ cm^2$ to 70 $\mu g/100\ cm^2$, therefore, within the criterion for disposal at a sanitary landfill. The remaining cell concrete was excavated and stockpiled on the southeastern corner of the cell, where it was loaded directly into a semi-trailer for off-Site disposal at CWM's sanitary landfill located in Danville, Indiana. Where possible, the cell concrete was excavated without intermixing of the HDPE underliner, however, some of the liner material was inadvertently mixed with the concrete as it was excavated. Since the sump area of the interim storage cell could potentially have been PCB contaminated at elevated concentrations, the sump was excavated and disposed of with the contaminated soil from the Site. Following removal of the Phase II interim storage cell, the underlying plant slab and all associated buried pipes were excavated and disposed of with the contaminated soil from the Site. Copies of the bills of lading for the concrete disposed of at the sanitary landfill are presented in Appendix E.

Following removal of a 23,000-gallon frac tank which had been temporarily situated on the Phase I interim storage cell for containment of excavation waters, the surface of the cell was scraped with hand shovels, followed by sweeping with hand brooms and pressure-washing of the cell to remove residual PCB contamination. A series of wipe samples and concrete chip samples were then collected from the surface of the Phase I interim storage cell. Results of PCB analyses performed on the wipe samples indicated that PCBs were not detected in the samples at concentrations exceeding the 100 $\mu g/100\ cm^2$ criterion applicable for disposal at a sanitary landfill. However, results of PCB analyses performed on the concrete chip samples indicated that at least the northeastern portion of the cell was contaminated with PCBs at concentrations above the 25 mg/kg criterion required for off-Site disposal at a sanitary landfill. Additional concrete chip samples were collected from the cell surface to further define the limit of PCB contamination exceeding the sanitary landfill disposal criterion, and PCBs were detected in the samples at concentrations ranging from 8 mg/kg to 530 mg/kg. During excavation and stockpiling of portions of the cell which had been demonstrated to achieve the disposal criteria, a portion of the cell concrete which did not achieve the 25 mg/kg disposal criterion was excavated and the concrete rubble was inadvertently mixed with the stockpiled concrete which did achieve the 25 mg/kg disposal criterion. Due to the mixing of the concrete rubble contaminated with PCBs at concentrations exceeding 25 mg/kg with the concrete rubble contaminated with PCBs at concentrations below 25 mg/kg, and since additional concrete chip sampling and analyses detected elevated concentrations of PCBs in the cell concrete, it was decided that all of the Phase II interim storage cell concrete would be considered as though it contained PCBs at concentrations exceeding the 25 mg/kg criterion. Accordingly, the concrete rubble was disposed of with the contaminated soil, at CWM's chemical waste landfill located in Emelle, Alabama.

Following completion of excavation activities in areas D35 and D34, excavation of contaminated soil proceeded towards the west into area D14 adjacent to the plant slab. On May 16, 1989 as the trackhoe excavated soil in sub-areas D14A and D32M, the trackhoe bucket inadvertently punctured the end of a steel underground storage tank beneath the northeastern corner of the Phase I interim storage cell and concrete plant slab. A small quantity of what appeared to be water discharged from the puncture hole. A sump was promptly excavated immediately adjacent to the end of the tank, to contain the water, and only a small quantity of water ponded within the sump area before the puncture in the tank was plugged. An HNu meter was used to measure organic vapors in the vicinity of the puncture, however, organic vapors were not detected. The overlying concrete from the Phase I interim storage cell and plant slab was excavated, and a black, steel, cylindrical tank approximately 8 feet in length and 3.5 feet in diameter with a short riser pipe was exposed. The top of the tank was located several inches beneath the concrete plant slab.

On close inspection it was determined that the tank had previously been closed in place by filling the tank with coarse sand. An attempt was made to remove the remaining water from the tank, however, due to the small quantity of water remaining the water could not be pumped. Several bags of absorbent material were poured into the tank to solidify the residual water, and the tank was excavated from the ground. The tank was transported to the truck loading area where it was crushed, and loaded for off-Site disposal with the contaminated soil.

Following removal of the underground tank, remaining concrete from the Phase I interim storage cell was excavated and transported to the truck loading area. The underlying plant slab and all associated underground pipes were excavated, and the excavation surface and pipe trenches were sampled. Results of PCB analyses performed on the samples in most cases indicated that cleanup criteria were achieved following initial excavation, however, several localized areas required re-excavation before cleanup criteria were achieved.

Following removal of the underground tank a number of sand pockets saturated with water and a brownish yellow colored oil were observed in the sidewalls and along the base of the tank excavation. As excavation proceeded, several sand pockets stained with oily liquid were observed extending to the south, west and north. Soil samples collected from the sand pockets during excavation often contained PCBs at concentrations ranging from several hundred milligrams per kilogram to several thousands of milligrams per kilogram. Additional soil samples collected from the silty clay material located immediately adjacent to the sand pockets in most cases either did not contain detectable concentrations of PCBs, or alternatively, contained very low concentrations of PCBs, well within cleanup criteria. At a depth of approximately 16 feet below grade, a gray till hard pan material was encountered. This material was similar to the hard pan material encountered further to the west in area D6, and similarly, either did not contain detectable concentrations of PCBs, or alternatively, contained very low concentrations of PCBs.

Between mid-May 1989 and mid-July 1989, concurrent with the excavation of the ravine area as described in Section 3.3.3.6, excavation activities proceeded from east to west in areas D38 and D32 over the northern portion of the former plant slab area. Isolated water-saturated sand pockets in the area were observed to contain droplets of brownish yellow oily liquid, and soil samples collected from the sand pockets often contained PCBs at concentrations of several thousand milligrams per kilogram. Soil samples collected from the silty clay material adjacent to the contaminated sand pockets in most cases either did not contain detectable concentrations of PCBs, or alternatively, contained only very low concentrations of PCBs, well within cleanup criteria.

Along the southern portion of area D32, where the contaminated sand pockets existed at considerable depths but were overlain by clean silty clay overburden material, the clean overburden was excavated and stockpiled on clean soil in area D38, to be used as backfill following excavation of the contaminated material. Prior to removing and stockpiling clean overburden, a series of soil samples were collected from the horizontal exposed surface of the overburden and from the adjacent excavation sidewalls overlying a contaminated sand pocket. If the soil samples collected from the overburden material contained PCBs at concentrations of less than 10 mg/kg, a clean Caterpillar 205 trackhoe was used to excavate the overburden material to the depth of where the lowest sample on the adjacent excavation sidewall which contained PCBs at a concentration less than 10 mg/kg. The Caterpillar 205 trackhoe was situated near the northern limit of area D38 during excavation of the overburden. Following completing the removal of the clean overburden material additional soil samples were collected from the remaining excavation surface to confirm that the overburden removed did not contain PCBs at concentrations exceeding 10 mg/kg. In the majority of instances, samples collected from the remaining excavated overburden surfaces did not contain PCBs at concentrations exceeding 10 mg/kg. In these instances, following removal of the contaminated material from the excavation area adjacent to the overburden stockpile, the overburden was backfilled into the base of the excavation, and subsequently, covered with a minimum of 3.5 feet of clean imported fill. In most cases, due to the considerable depth of the excavation, the backfilled overburden material was covered with more than ten feet of clean imported fill.

On several occasions, one or more samples collected from the remaining surface following removal of the clean overburden contained

PCBs at concentrations exceeding 10 mg/kg. On these occasions, the entire stockpile of excavated overburden material was removed and transported to the truck loading area to be loaded for off-Site disposal with the other contaminated soil and debris.

As excavation proceeded west in area D32, contaminated sand pockets were observed at varying depths ranging from approximately six feet to 18 feet below grade. A continuous water-saturated sand seam, as was observed in area D6, was not encountered until sub-areas D32A and D32B were reached. As excavation activities in area D6 continued towards the east, it was determined that the contaminated sand seam extended through areas D2 and D9 to sub-areas D32A and D32B. As excavation proceeded in these areas soil samples were collected from the southern excavation sidewall, to determine the southern limit of PCB contamination. Samples collected from the sand seam at area D38G at a depth of approximately 14 feet to 16 feet below grade contained elevated concentrations of PCBs. Following removal and stockpiling of the overlying clean overburden material, the contaminated sand seam was excavated a distance of approximately 15 feet towards the south before the cleanup criterion was achieved. Excavation activities then proceeded to the north through area D9 towards the former plant production well. The saturated sand seam was found to terminate approximately 20 feet south of the former plant production well. However, as observed earlier in the project before excavation activities were temporarily suspended in areas D6 and D7, the sand seam appeared to extend towards the west into areas D7 and D11, and possibly beneath the 50,000-gallon modular tank containing treated wastewater.

Since relocation of the 50,000-gallon modular tank was required prior to excavation of the underlying contaminated sand seam, excavation activities in this area were temporarily suspended until the modular tank was relocated later in the project, following completion of excavation activities in the ravine area. It was anticipated that following completion of excavation and backfilling activities in the ravine area, there would no longer be a need to treat and store large quantities of wastewater, and therefore that would be the most suitable time to dismantle and remove the 50,000-gallon modular tank. The deep excavation resulting from excavation of the oily sand seam in areas D38, D32, D2, and D9 was backfilled to within approximately 20 feet of the excavation sidewall adjacent to the modular tank, in order to minimize the collection of stormwater in the area. Excavation activities were not performed again in this area until November 1989, as detailed in Section 3.3.3.7.

The concrete cinder-block building housing the former plant production well was demolished and the demolished material was disposed of with the contaminated soil. In addition, the concrete floor of the pumphouse building which surrounded the well casing was carefully dismantled using a concrete ram attached to a backhoe, and was disposed of with the contaminated soil. Cement grout was poured around the well casing to re-seal the well from infiltration of surface waters. In addition, in preparation for backfilling around the well, a 2-foot diameter compression flange well extension and a bolted well cover was added to the well casing.

3.3.3.6 Excavation of Ravine Area

3.3.3.6.1 General

In order to eliminate the need to construct a large access ramp extending to the northernmost end of the ravine at the confluence with Little Sugar Creek, rather than excavating the entire ravine invert moving in a downgradient direction the ravine invert was excavated working downgradient from ravine reference Station 20+00 to Station 11+00, then in an upgradient direction from Little Sugar Creek to Station 11+00. Adjacent to Station 10+00 a ramp was constructed to allow transport of contaminated soil and sediment from the ravine area to the truck loading area. The ravine reference stations are shown on Plan 4.

Prior to commencing excavation in the ravine area, trees and brush were removed from the active work area to provide access for construction equipment and personnel. Trees and bush in the active work areas were cut approximately 18 inches above grade. Vegetation existing above the 18-inch mark was lifted from the area using chains or cables, without contacting potentially contaminated areas of the ground surface. Alternatively, if trees or brush could not be lifted and removed from the area easily, polyethylene sheeting was placed on the ground surface and the trees and brush were felled on the polyethylene sheeting to prevent contact with the underlying potentially contaminated soil. Sections of trees cut above the 18-inch mark were cut into manageable pieces and removed from Site for disposal at CWM's sanitary landfill located in Danville, Indiana. In addition, some of the logs were provided to Superior, presumably to be used as firewood. Brush material cut above the 18-inch mark was, in most instances, shredded into small chips using a wood chipper, prior to disposal at CWM's sanitary landfill. Copies of the bills of lading for these non-contaminated materials disposed of at the sanitary landfill are presented in Appendix E.

Vegetation existing below the 18-inch mark was excavated and disposed of with the contaminated soils.

The HDPE liners installed over the western ravine bank at the location of excavation performed during the Phase I and Phase II activities were removed and disposed of with the contaminated soil.

3.3.3.6.2 Ravine Excavation - Station 20+00 to Station 11+00

Prior to commencing excavation of soil and sediment from the ravine area, sediment traps were installed and/or upgraded, as necessary, at various locations along the invert of the ravine, as shown on Plan 4. Sediment traps consisted of several straw bales staked into the ravine invert, with a synthetic oil absorbent boom placed on the upgradient side of the straw bales.

In order to maintain the ravine invert as dry as possible during excavation activities, an earthen diversion dam was constructed immediately upgradient of Station 20+00, and a centrifugal pump was installed adjacent to the dam. A 4-inch diameter water hose was routed along the level area adjacent to the eastern ravine bank, and was situated to discharge water down the eastern ravine slope near Station 11+00.

On June 6, 1989, excavation of the ravine area at Station 20+00 commenced. Excavation of the uppermost 50 feet of the ravine was performed using the LS-3400 trackhoe, with the trackhoe situated in the ravine invert. A nominal one foot of material was excavated from the western ravine bank prior to excavation of a minimum of one foot of wet sediment from the ravine invert. Following removal of the wet sediment, the remaining soil in the ravine invert appeared to be relatively dry. The excavated material was temporarily stockpiled on the eastern portion of area C4, which was used as a travel path for equipment and personnel. A trackloader was then used to transport the stockpiled material through the eastern and northern portions of Superior's parking lot to the truck loading area.

Further downgradient from Station 19+00 the trackhoe excavated the ravine invert while situated on top of the western ravine bank. During excavation of the ravine invert near Station 18+25, a number of plastic 5-gallon pails, and three partially crushed 55-gallon drums, were uncovered. The majority of the 5-gallon pails appeared empty, however, a number contained what appeared to be ravine sediment with some surface water. One of the 55-gallon drums was empty, and another contained ravine sediment and a grayish colored solid material. The third drum contained approximately 20 to 30 gallons of yellow paint. The drums and pails were crushed and excavated, and transported to the truck loading area to be removed from Site with the contaminated soils.

During excavation near Station 18+00, a 6-inch diameter concrete pipe was observed extending along the invert of the ravine. The pipe was excavated and removed as it was traced upgradient along the ravine invert. The pipe was located, in general, approximately two feet beneath the base of the excavated ravine invert, and it was determined that the pipe entered the ravine area near Station 19+25. None of the soil samples collected from the pipe trench following excavation contained PCBs at concentrations exceeding 1 mg/kg. A sample collected from the sediment in the invert of the pipe where the pipe entered the ravine area near Station 19+25 contained PCBs at a concentration of 1.6 mg/kg. Through excavation it was determined that the pipe was connected to a subsurface water drain pipe located along the eastern side of Superior's facility. The pipe was excavated, removed and replaced with a new pipe which discharged to the ravine area.

Upon completion of excavation activities in the ravine between Station 20+00 and Station 18+00, the eastern portions of area C4 and the western ravine bank upgradient of this section of the ravine were excavated to a nominal depth of one foot. In addition, excavation of pipes numbered 1, 2, 5, 30 and 36 was performed, as shown on Plan 6. Analytical results received from soil samples collected from the excavated surface of area C4 indicated that, in general, the cleanup criterion was achieved following the initial 1-foot excavation. Upon achieving the cleanup criterion in the ravine area between Station 20+00 to Station 18+00 and in the adjacent excavated portions of area C4, these areas were backfilled with clean imported material. A second earthen diversion dam was constructed of clean imported fill material at Station 18+00 in preparation for removal of the initial diversion dam located at Station 20+00.

Prior to commencing excavation of the ravine area downgradient of Station 18+00, a containment dam was constructed at Station 16+00 using contaminated soil and sediment, covered with a sheet of polyethylene. The purpose of the dam was to contain potentially contaminated stormwater which may pond in the ravine area during excavation between Station 18+00 and Station 16+00. As excavation of the ravine invert proceeded downgradient from Station 18+00, the trackhoe continued to operate from a position on the western ravine bank. Following initial excavation of approximately one foot of sediment from the ravine invert between Station 18+00 and Station 17+00, a soil sample collected from the ravine invert contained PCBs at a concentration of 4,500 mg/kg. Following excavation of an additional approximately six inches of sediment from the area, a relatively hard layer of hard pan material was encountered, similar to the material encountered at approximately 16 feet to 18 feet below grade over the northern portion of the plant slab area. Several drops of a dark oily liquid were observed on the surface of the hard pan material, and also further to the west where a deep pipe trench excavation common to pipes numbered 2, 5, 30, and 36 met the ravine area. The oily liquid appeared to be concentrated mainly within isolated sand pockets present within the hard pan material. A series of soil samples were collected from the sand pockets and the hard pan material along the invert of the ravine and from the clay material along the ravine excavation sidewalls. In the majority of instances, PCBs were not detected in the soil samples collected from the hard pan or clay material, however, samples collected from the oily sand pockets contained elevated concentrations of PCBs.

Due to the elevated concentrations of PCBs detected in the ravine area, investigative surficial soil samples were collected from the undisturbed ground surface adjacent to the eastern ravine bank between Station 15+00 and Station 19+05. In general, these soil samples were collected at distances of approximately 50 feet to 80 feet east of the center line of the ravine area. PCB concentrations detected in these soil samples ranged from 1 mg/kg to 4.3 mg/kg. Based on the impracticality of equipment access, the considerable number of trees in the areas where the investigative soil samples were collected, and the low concentration of PCBs detected in the samples, it was decided that surficial soil excavation in the vicinity of these samples would be limited to those areas which could be accessed for soil excavation with minimal disturbance to previously excavated clean areas and with minimal removal of large trees. Accordingly, a nominal 10 inches of soil was excavated from the majority of the eastern ravine bank and confirmatory soil samples were collected from the excavation surface. In all instances the cleanup criterion was achieved in confirmatory soil samples collected from the excavated surface; in most of the confirmatory soil samples PCBs were not detected. Prior to backfilling these areas with a minimum of 10 inches of clean imported fill material, contaminated portions of the vertical eastern ravine bank were excavated towards the east. Excavation of the eastern ravine bank proceeded towards the east by distances of up to approximately 35 feet between Station 16+00 and Station 17+25 before the cleanup criterion along the ravine bank was achieved. Excavation of underground pipes numbered 1, 2, 5 and 30 proceeded a considerable distance towards the west, as shown on Plan 6, before these areas were confirmed to meet the cleanup criterion. After completing excavation of the underground pipes and the eastern ravine bank between approximately Station 17+25 and

Station 16+00, excavation of the ravine invert and western ravine bank in this area continued. As observed previously, PCB contamination along the ravine invert and banks appeared to exist mainly within isolated sand pockets, whereas the surrounding hard pan material in most cases either did not contain detectable concentrations of PCBs, or alternatively, contained only very low concentrations of PCBs, well within cleanup criteria.

During excavation activities in the ravine area between Station 18+00 and Station 16+00 periods of excessive rain were experienced at the Site, and the rate of excavation in the ravine area and other areas of excavation at the Site decreased substantially. Following periods of heavy rainfall, in most instances it required several days of dewatering the ravine excavation areas before excavation could continue. In addition, following removal of stormwaters from the excavation areas, at times it required several days to solidify and remove wet sediment before productive excavation of in-situ sediment and soils could continue.

Due to the excessive rain experienced at the Site, the two frac tanks containing untreated stormwaters and equipment decontamination waters were essentially continuously filled, and excavation dewatering activities proceeded slowly due to the lack of available water storage capacity. In order to expedite the removal of ponded waters from the excavation areas, on June 12, 1989 CWM commenced installation of a second 50,000-gallon modular tank, for temporary containment of untreated stormwater. The modular tank was constructed of a steel frame fitted with a HDPE liner, and was installed at the northeastern portion of area D13, as shown on Plan 4. Stormwaters from the ravine excavation areas was pumped to the modular tank, and subsequently, pumped to the on-Site treatment facility for treatment when storage capacity in the frac tank became available. Although installation of the modular wastewater storage tank was effective in temporarily storing a large quantity of stormwater, and therefore expediting the rate of excavation in the ravine area, due to the excessive rain experienced over the summer months excavation of the ravine area downgradient to Station 16+00 was not completed until late August 1989.

In general, between Station 17+25 and Station 16+00 an average depth of approximately nine feet of sediment was excavated from the ravine invert before the cleanup criterion of 1 mg/kg was achieved.

Upon completion of excavation activities in the ravine area between Station 18+00 and Station 16+00 excavation continued downgradient to Station 15+00, and subsequently, the surface of areas C4, D24, D25, D22 and D21 in Superior's parking area were excavated to a nominal depth of approximately one foot. In general, the cleanup criterion was achieved in these areas of Superior's parking area following the first or second excavation. The total excavation depth in these areas was approximately one foot to 1.5 feet, except where the ravine excavation extended into the western ravine bank.

Concurrent with excavation activities in the ravine area between Station 18+00 and Station 15+00 a large quantity of clean imported backfill material was stockpiled in the clean area immediately upgradient of Station 18+00, in preparation for backfilling remaining excavated portions of the ravine. Upon completion of excavation of the ravine area downgradient to Station 15+00 the clean backfill was graded into the deep ravine excavation using a Caterpillar D5 bulldozer. Clean areas of Superior's parking lot to the south and west of ravine Station 15+00 were also backfilled in order to prevent cross-contamination from runoff in the event of rain. In order to facilitate reconstruction of the drainage course of the ravine, the ravine area was backfilled to an elevation well above the initial grade of the ravine invert. Later in the project, following initial placement of backfill in the ravine area several hundred feet, further downgradient, the CAT D5 bulldozer was used to grade a smooth drainage course along the original location of the ravine invert. By reconstructing ravine contours in this manner, a relatively consistent invert grade and smooth ravine side slopes were attained.

In preparation for continuing excavation of the ravine area further downgradient, another large diversion dam was constructed across the ravine area near Station 15+00, using clean imported fill material. A 4-inch diameter pump was installed on the top of this dam, and the hose was routed to discharge diverted water down the ravine bank area near Station 6+00.

Between late August 1989 and early October 1989, excavation of the ravine area proceeded downgradient from Station 15+00 to Station 10+20. Investigative surficial soil samples collected from on top of the eastern ravine bank in this area contained low concentrations of PCBs in most instances less than 10 mg/kg. These areas were excavated to a nominal depth of 10 inches, and confirmatory soil samples collected from the excavation surfaces in all cases contained PCBs at concentrations of less than 10 mg/kg.

Following completion of excavation along the top of the eastern ravine bank excavation activities were concentrated on the ravine invert and adjacent banks. As excavation proceeded, oily sand pockets containing elevated concentrations of PCBs were observed along the ravine invert and adjacent vertical ravine banks, as were previously observed in the upgradient portions of the ravine. In most cases, as noted previously, PCB contamination was restricted to isolated sand pockets and sand seams, whereas the surrounding hard pan material was clean. Several excavations of the vertical ravine banks were required before the contaminated sand pockets were either removed or the cleanup criterion was achieved.

A number of heavy rainstorms caused extensive ponding of water in the ravine area between Station 15+00 and Station 12+00 and caused delays in performing excavation activities. Following a significant rainstorm, several days of excavation dewatering and solidification of wet sediment using drier contaminated soil were often required before excavation activities in the ravine area could resume. During excavation the LS-3400 trackhoe was situated on the western ravine bank or in the ravine invert, as necessary. Excavated material was temporarily stockpiled above the western ravine bank, then was transported by the trackloader to the truck loading area.

On October 7, 1989, during excavation of a former swale area along the top of the western ravine slope west of Station 13+00 personnel standing at a clean backfilled area of the ravine near Station 13+00 detected a solvent-like odor, apparently originating from the swale area as it was excavated. This swale area was located near the southern portion of a former capacitor disposal area identified and excavated during Phase I activities at the Site. An HNu meter was used to measure organic vapors at the ravine area near Station 13+00 where personnel noticed the solvent-like odor, however organic vapors were not detected. Subsequently, measurements of organic vapors were collected near a small area of brownish purple stained soil in the immediate excavation area, and organic vapors were detected at concentrations in excess of 2,000 (parts per million) ppm. Following excavation of the stained soil, organic vapor measurements had decreased to 1 ppm to 2 ppm in the excavation area. Two soil samples were collected from the base of the excavation at this area and were submitted to the on-Site laboratory for PCB analyses. Results of the analyses indicated that the samples contained PCBs at concentrations of 120 mg/kg and 285 mg/kg. Upon returning to the area to perform additional excavation to achieve cleanup criteria, a small quantity of brown oily liquid was observed in the swale area approximately 18 feet further to the southwest of the previously noted sample locations. This area and the adjacent area were re-excavated by additional depths of up to three feet, and a total of five confirmatory soil samples were collected from the base and sidewalls of the excavation. Results of PCB analyses performed on the samples indicated that cleanup criteria were achieved in all of the samples.

Upon completion of excavation activities along the ravine invert and side slopes between Station 15+00 and Station 13+00, the excavation surfaces were backfilled with imported backfill material which had previously been stockpiled at the diversion dam near Station 15+00. Following completion of excavation activities in the ravine invert and adjacent side slopes between Station 13+00 and Station 11+00, on the evening of October 9, 1990, these areas were backfilled with clean imported material. Due to the lack of availability of trucks for transporting clean backfill material to the Site during normal working hours, and since there was a threat of heavy rain forecasted for the next day, a lighting system was installed on Site so that backfilling could be performed during the night time when trucks were available. During the afternoon a rack of mercury-vapor lights was installed at the top of the ravine west of Station 13+00. The lights were capable of casting a broad beam of light over the entire ravine area from approximately Station 14+00 to Station 9+00. From approximately 5:30 p.m. to midnight, approximately 80 truck loads of backfill material were delivered to the Site. The CAT D5 bulldozer was used to grade backfill into the ravine area and over the side slopes. Concurrent with the backfilling and grading, a Dresser roller was used to compact the placed fill. By the end of the evening the initial placement of backfill material was completed in the ravine area and on the ravine side slopes at all areas upgradient of Station 11+00.

3.3.3.6.3 Ravine Excavation - Station 0+00 to Station 11+00

Since the large diversion dam formerly extending across the ravine area near Station 15+00 had been removed when backfilling adjacent portions of the ravine, another diversion dam was constructed near Station 11+00. A large earthen dam was constructed at this location, since it would be required to remain in place for containment of all upgradient stormwater runoff until excavation of all downgradient portions of the ravine area were completed. The clean backfill material from which the dam was constructed was compacted, as were the sides of the dam, to minimize erosion in the event of rain. Upon completion, the dam was approximately 15 feet high and more than 15 feet in thickness at the base. A 6-inch diameter centrifugal pump was installed on top of the dam, with the lower sump intake extending by hose to the base of the restored ravine invert immediately upgradient of the dam. A 6-inch diameter discharge hose was connected to the pump and was routed approximately 500 feet to the north along the eastern ravine slope to the steep bank leading down to Little Sugar Creek. Prior to commencing excavation and removal activities between the confluence of the ravine and Little Sugar Creek, the diversion pumping system was tested, and was found to be in good working condition.

Prior to commencing excavation of the ravine area at Station 0+00 adjacent to Little Sugar Creek, an access path for personnel and machinery was cleared along the invert of the ravine from Little Sugar Creek upgradient to the diversion dam near Station 11+00. Chain saws were used to cut several large trees that had been lying across the ravine into manageable pieces for removal. Large tree stumps and boulders were removed from the ravine invert using the LS-3400 trackhoe, and were transported to the truck loading area using either the trackhoe or the Caterpillar 963 trackloader. Large sections of trees were removed from the ravine area using a crane and steel cables, operating from the clean area at the top of the ravine between Station 2+00 and Station 8+00. Trees which were removed and did not come into contact with contaminated soil or machinery, were temporarily stockpiled in a clean area of the Site prior to removal and off-Site disposal at CWM's sanitary landfill located in Danville, Indiana. Copies of the Bills of Lading for the tress disposed of at the sanitary landfill are presented in Appendix E.

Minor regrading of the western ravine slope between Station 10+00 and Station 9+00 was performed using the L8-3400 trackhoe, to construct a ravine access ramp for machinery and personnel during excavation activities in the lower sections of the ravine. The location of the ravine access ramp is shown on Plan 4.

On October 12, 1989 excavation of the ravine area immediately adjacent to Little Sugar Creek commenced. Prior to excavating the ravine invert, potentially contaminated soil and sediment was excavated from the ravine banks. During excavation of the ravine area excavated material was temporarily stockpiled upgradient of and behind the trackhoe, where it was removed by the trackloader and transported to the truck loading area. By the end of the first day of excavation, initial excavation of the ravine banks and ravine invert was completed upgradient to Station 2+00. At the end of the work day, a small dam was constructed immediately upgradient of the excavation near Station 2+00, using excavated contaminated material. This dam was constructed to collect water which may infiltrate into contaminated portions of the ravine further upgradient, and therefore prevent this water from cross-contaminating clean excavated portions ravine invert further downgradient. As an additional precaution against cross-contamination, the dam and excavated ravine invert and banks were covered with 3-mil polyethylene sheeting. It was initially intended to line the ravine invert with a heavier 20-mil HDPE liner. However, since the weather forecast was for dry conditions for the next several work days and because installation of the heavier liner would slow the progress of excavation activities, it was decided that the thinner liner would be sufficient as an interim precaution. In preparation for a potential sudden change in the weather forecast, however, a section of 20-mil HDPE liner was made available and a number of steel "staples" for securement of the liner were constructed, in case it became necessary to install the liner quickly.

Excavation of the ravine invert and ravine banks proceeded upgradient to Station 5+00 over the next two days without major difficulty. As excavation activities in the ravine area proceeded, soil samples were collected from the excavated surfaces along the ravine invert and ravine banks at 25-foot intervals. In most areas the cleanup criterion of 1 mg/kg along the ravine invert and 10 mg/kg along the ravine banks were achieved following the initial excavation. However, several areas along the ravine invert required a second excavation before the cleanup criterion was achieved. Following excavation of a nominal layer of relatively soft sediment from the ravine invert, a very hard, gray, hard pan material was encountered, as was observed in the upper sections of the ravine. Between Little Sugar Creek and Station 5+00 an average depth of approximately 1.5 feet of sediment was excavated.

As excavation proceeded, excavated material was temporarily stockpiled immediately upgradient of the trackhoe. The Caterpillar 963 trackloader was used, in general, to transport the excavated material directly from the temporary stockpile up along the ravine access ramp to the truck loading area. However, on several occasions when the invert of the ravine was too soft or too wet for operation of the trackloader, the larger LS-4300 trackhoe was used in conjunction with the LS-3400 trackhoe to move the excavated material further upgradient to where it could be accessed by the trackloader. At the end of each work day, a dam was constructed at the most upgradient excavated section of the ravine invert, and all excavated surfaces in the ravine area were covered with 3-mil polyethylene sheeting.

Upon completing excavation of the ravine invert and ravine banks upgradient to Station 5+00, a 20-mil HDPE liner was installed along the ravine invert between Little Sugar Creek and Station 5+00. Staples constructed of steel reinforcing bar material were hammered through the liner to secure the liner to the hard pan material along the base of the ravine invert, and along the ravine banks to a height of approximately one foot above the invert. The staples were installed at approximately 3-foot intervals, and provided an effective seal against the hard pan. The 3-mil polyethylene sheeting was left in place over the excavated portions of the ravine banks, and was secured in place using wooden stakes and sand bags. Installation of the 20-mil HDPE liner along the ravine invert and polyethylene sheeting over the ravine banks was performed on a daily basis, until excavation in the ravine area was completed.

Following initial excavation of the ravine area at Station 5+25, a soil sample collected from the ravine invert contained PCBs at a concentration of 49,000 mg/kg. Upon inspection of the ravine banks at this location, oil staining was observed in a low lying sand pocket located in the eastern ravine bank at Station 5+25. Additional soil samples collected from the vertical portions of the eastern and western ravine banks in this area contained PCBs at concentrations ranging from "non-detect" to 120 mg/kg. Both ravine banks were excavated several times before the 10 mg/kg cleanup criterion was achieved. A small quantity of assorted metal debris was observed adjacent to the western ravine bank near Station 5+40, and was excavated and removed. The eastern ravine bank between approximately Station 5+20 to Station 5+40, was excavated by a distance of up to approximately ten feet to the east before the cleanup criterion was achieved. Upon completion of excavation of the ravine banks, re-excavation of the ravine invert from approximately Station 5+10 to Station 5+40 was performed several more times before the 1 mg/kg cleanup criterion was achieved. The ravine invert between approximately Station 5+20 and Station 5+30 was excavated to a total depth of approximately 10 feet below grade.

Excavation of the ravine invert and banks proceeded upgradient to Station 8+25 before visible oil in the ravine area was observed again. During excavation of the western ravine bank adjacent to Station 7+25, beneath where Pipe 12 formerly discharged, elevated concentrations of PCBs were detected in several sand pockets. However, the cleanup criterion was readily achieved in these areas following re-excavation. During excavation of the western ravine bank in the area beneath the former discharge locations of Pipes 14 and 34, and along the ravine invert at Station 8+25, brownish yellow colored oil was again observed within isolated sand pockets. Although the cleanup criterion was achieved along the ravine invert in this area following the first re-excavation, the western ravine bank pipe trenches required several re-excavations before the cleanup criterion was achieved. Following completion of excavation of these areas excavation continued in the ravine area between Station 8+25 and the diversion dam located at Station 11+00, and up the ravine access ramp between Station 9+00 and Station 10+00.

As backfilling of the ravine area from Station 11+00 downgradient to Little Sugar Creek commenced, another large earthen dam was constructed near Station 8+25 using clean imported fill material. Trucks transporting clean fill to the Site backed onto this dam or onto the top of the adjacent ravine bank to dump the fill. The CAT D5 bulldozer was then used to grade the clean fill material over the excavated portions of the ravine banks and over the ravine invert. A clean trackhoe was used to place and compact clean imported clay fill material on the steep portion of the excavated ravine banks, to mitigate the potential for erosion. The bulldozer graded clean material downgradient through the ravine in such a manner that the bulldozer did not come into direct contact with the excavation surfaces. As the bulldozer graded backfill material into the ravine area the HDPE liner and polyethylene sheeting covering the ravine invert and ravine banks was removed and transported to the truck loading area for off-Site disposal with the contaminated soil.

Upon removing the HDPE liner from the ravine area and prior to backfilling near Station 5+25, a small quantity of brownish yellow colored oil was observed in the ravine invert. The oil appeared to have originated from an isolated sand pocket located in the western ravine bank near Station 5+34. An oil absorbent boom and sediment trap were immediately installed further downgradient at Station 5+10 to prevent the oil from migrating further downstream. The leading edge of the 20-mil HDPE liner at Station 5+10 was secured using rebar staples to provide a tight seal against the ravine invert. The western ravine bank and the adjacent portion of the ravine invert between Station 5+15 and Station 5+35 were re-excavated several times before additional soil samples confirmed that cleanup criteria were achieved. Initially a small Caterpillar 211 trackhoe and the Caterpillar 910 rubber-tired loader were used to perform the re-excavation and removal activities required in this area. While situated on clean backfill material previously placed along the ravine invert, the trackhoe excavated the contaminated material and loaded it directly into the bucket of the loader. The loader was situated on the clean backfill in the ravine invert, slightly upgradient of the trackhoe. The loader transported the excavated material upgradient along the ravine invert and across the ravine slope and dam area near Station 8+25 to the truck access ramp adjacent to the Site weigh scales. The excavated material was placed in a stockpile in the Exclusion Zone immediately adjacent to the truck loading area. During excavation and loading activities polyethylene sheeting was placed over adjacent clean areas of the ravine banks and the ravine invert in order to prevent cross-contamination from incidental spillage. On the second day of re-excavation in the ravine area near Station 5+25, a Volvo BM A-25 all-terrain dump truck was mobilized to the Site to expedite transport of the contaminated material to the truck loading area. Due to the larger capacity of the box of the all-terrain dump truck, loading and transportation of the contaminated material to the truck loading area was performed more efficiently.

Following completion of re-excavation activities in the ravine, the Volvo BM A-25 all-terrain dump truck was used to transport the HDPE liner, polyethylene sheeting and reinforcing bar staples to the truck loading area. The CAT D5 bulldozer was used to grade clean imported backfill material along the ravine invert and ravine banks. The CAT 211 trackhoe was used to place a nominal six inches of topsoil along the ravine banks, and a 1-foot layer of minimum 2-inch diameter stone was placed on the top of the clean fill material along the ravine invert using the CAT 910 rubber-tired loader.

Concurrent with the work activities performed near Station 5+25, excavation of the ravine access ramp between Station 9+00 and

Station 10+00 was completed. When the cleanup criterion was achieved along the ravine access ramp, excavation proceeded in a southwestern direction along the top of the ravine. Based on PCB analytical results obtained from a series of investigative soil samples collected from area D33, a nominal ten inches of surficial soil was excavated and removed from the area. In addition, as a precaution and because the surrounding surficial soils contained residual concentrations of PCBs, a nominal 10 inches of soil was excavated from area D40 located to the south of area D33. Prior to excavation of areas D33 and D40, trees and brush were cut off approximately 18 inches above grade. As described previously, vegetation cut from above the 18-inch mark was disposed of at CWM's sanitary landfill located in Danville, Indiana, and vegetation below the 18-inch mark was disposed of with the contaminated soil.

Confirmatory soil samples collected from excavation trench of Pipe 14, adjacent to the ravine access ramp, contained PCBs at concentrations exceeding the cleanup criterion, and additional excavation was performed. Upon achieving the cleanup criterion in the pipe trench and also along the ravine access ramp, the access ramp, pipe trench, and invert of the ravine area between the diversion dams located at Station 8+25 and Station 11+00 were backfilled with clean imported material. In addition, placement of a 1-foot layer of 2-inch diameter stone along the ravine invert in this area was completed. A berm was constructed of clean material along the top of the access ramp to prevent cross contamination of backfilled areas from stormwater runoff from contaminated areas.

Along the top of the western ravine bank, excavation continued in the northeastern corner of area D10. A nominal depth of approximately 1.5 feet was excavated from the northeastern portion of area D10 before the cleanup criterion was achieved. The last remaining section of Pipe 14 was excavated from the area located west of sub-area D10P. Upon reaching area D100 excavation and backfilling activities in this area were temporarily discontinued to expedite excavation activities in area D11, as detailed in Section 3.3.3.7, to maintain an access route for construction equipment and personnel.

3.3.3.7 Deep Excavation Adjacent to Terra Products

Prior to continuing excavation activities in area D11, it was necessary to solidify and remove a considerable amount of wet soil and backfill material which had sloughed into the excavation area during the previous months. On November 6, 1989 solidification of saturated material in area D11 using kiln dust was initiated. Using the Link Belt LS-3400 trackhoe situated on an access ramp northwest of the former plant production well, imported kiln dust was mixed with the saturated material. Upon solidifying the saturated material, the LS-3400 trackhoe transferred the material to a temporary stockpile location near sub-area D11B. The LS-4300 trackhoe transferred the material from the stockpile to a second temporary stockpile near area D10F, where the trackloader was then used to transport material to the truck loading area. Solidification and removal of saturated material from area D11 was completed on November 11, 1989, and additional sampling and excavation of in-situ material then continued.

Concurrent with the solidification of material in area D11, decontamination and dismantling of the treated wastewater modular tank was performed. The modular tank liner was pressure washed and the wash water transferred to the frac tank used to store untreated wastewaters. Wipe samples collected from the liner confirmed that the liner was clean. The steel framework of the tank was dismantled and the tank liner was removed. Upon dismantling of the tank, two confirmatory soil samples were collected from the previously backfilled material existing beneath the base of the tank to confirm that the wastewater stored in the tank had not impacted the underlying soils. PCBs were not detected in either of the two confirmatory samples collected.

Soil samples collected approximately five feet below grade along the western excavation sidewall of area D7 and along the northern, southern and western sidewalls of area D11, contained PCBs at concentrations less than 1 mg/kg. Therefore, where feasible, the material was excavated and stockpiled to be used as backfill material. Following completion of excavation of the clean overburden material additional soil samples collected from the remaining soil surface further confirmed that no soil material containing PCBs at concentrations exceeding 10 mg/kg had been removed with the clean overburden.

Analytical results received from soil samples collected from the low-lying sand seam, as well as the visual presence of oil droplets indicated that significant PCB contamination, isolated to the low-lying sand seam in the western sidewalls of areas D7 and D11, extended further toward the west. As excavation activities continued towards the west, overburden material which was confirmed not to contain PCBs at concentrations exceeding 10 mg/kg, and therefore which was suitable for use as backfill material, was excavated wherever possible, and stockpiled to be used as backfill material following the completion of excavation activities in this area.

Due to the areal extent of excavation required, access to trucks for the off-Site removal of contaminated material could not be maintained along the gravel roadway adjacent to Terra's facility. It was therefore necessary to stockpile all excavated contaminated material on Site at the truck loading area, until the excavation in the access roadway area could be backfilled and the roadway reopened.

On November 28, 1989, excavation of Pipe 34 through sub-areas A6D and A4 to the origin of the pipe at the drain in Terra's loading dock was completed. None of the samples collected from the base of the pipe trench contained PCBs at concentrations exceeding 1 mg/kg. The excavated pipe was replaced with a new 6-inch diameter PVC pipe, and the pipe trench was backfilled with clean material. The remaining pipe installation, extending towards the northeast to discharge into the ravine, was completed later in the project, as noted in Section 3.5.

To reduce the risk of cross-contamination of clean areas of the base of the excavation area during excavation of the low lying sand seam in the area of the access roadway adjacent to Terra's building, small containment berms were constructed at the base of the excavation near the excavation face at the end of each work day. The berms were effective at containing oily water which discharged from the sand seam overnight. Water which accumulated within the berms was transferred to the on-Site water treatment facility and treated.

On December 6, 1989 excavation towards the west in the vicinity of the access roadway adjacent to Terra's building was temporarily discontinued, until February 1993, as discussed in Section 4.0, due to the close proximity to Terra's building. Upon discontinuing excavation activities in this area PCB concentrations ranging from 36 mg/kg to 37,000 mg/kg remained in the low-lying sand seam adjacent to Terra's building. To prevent migration of PCB contamination from the contaminated sand seam to the east following backfilling, a 20-mil HDPE liner was installed along the excavation sidewall as shown on Plan 3. The HDPE liner was installed from the base of excavation to grade, where it was secured in place by wooden stakes prior to backfilling.

Excavation in the vicinity of the access roadway adjacent to Terra's building continued along the exposed northern excavation sidewalls. As excavation proceeded, soil samples were collected from the clay overburden material overlying the low-lying sand seam, and where possible, clean overburden was excavated and stockpiled to be used as backfill. As excavation proceeded from west to east, confirmatory soil samples were collected from the low-lying sand seam and clay overburden material, until the former excavation limit at area D11 was reached. Soil samples collected from the sand seam along the northern excavation sidewalls prior to backfilling contained PCBs at concentrations ranging from "non-detect" to 2.1 mg/kg, therefore within the cleanup criterion.

Excavation activities then proceeded towards the northeast along the access ramp through area D11. The cleanup criterion was readily achieved in the area, and excavation proceeded in an expeditious manner. Contamination in the form of visible oil was not observed again over the remainder of the Phase III Removal Action.

As excavation proceeded into areas D11B and D10, previously identified Pipe 34 and Pipe 12 were excavated and removed, concurrent with excavation of the surficial soils in the area. The frac tank previously used as the feed tank for the wastewater treatment system was removed and the underlying ground surface was excavated to a nominal depth of 10 inches. Excavation continued towards the north through areas D10, D103 and D104 to the Phase III decontamination pad and truck weigh scales, and concurrently, the excavation and removal of Pipe 34 and Pipe 12 was completed. PCB analyses performed on soil samples collected from the excavated surfaces confirmed that the cleanup criterion was achieved. Due to substantial rutting in the vicinity of the truck loading area, caused by the high volume of heavy construction equipment travelling in this area over the duration of the project, at least two feet of material was excavated over most of the area. However, analytical results received from soil samples collected from the excavated surface confirmed that over most of this area, the cleanup criterion was achieved following the first excavation.

3.4 SITE RESTORATION

3.4.1 General

To the extent possible, backfilling of excavated areas where cleanup criteria was achieved was performed as soon as possible following receipt of the PCB screening data. As detailed in section 3.2, the PCB screening data was used as the basis for determining whether backfilling could be performed, however, the final CLP confirmatory data was used as the final basis for confirming that a cleanup criteria was achieved in given area.

Factors which limited the ability to backfill excavation areas where cleanup criteria was achieved included snowfall, rainfall, water ponded within the excavations, and at other times, wet conditions at the borrow pit area from where the imported backfill material was obtained. In addition, because several other large construction projects were in progress in the Indianapolis area concurrent with the Phase III Removal Action, at times, only a limited number of trucks were available to transport clean backfill material to the Site.

The borrow pit area from where the imported fill materials were obtained during the project was operated by J.A. Haynes Gravel, Inc., and was located approximately 12 miles to the northeast of the Site. The imported fill materials were periodically sampled and analyzed for PCBs, and in no cases were PCBs detected in the samples.

Except as noted in the following sections, backfill materials were, in most cases, placed in nominal 6-inch to 12-inch lifts and compacted to 95 percent of the maximum dry density of the soil. All excavated areas on Site were backfilled with a minimum of 10 inches of clean imported backfill material. Where possible, compaction of the backfill material was performed using a vibrating drum roller, however, in several confined areas or areas with significant slopes, such as the lower portions of the ravine area, compaction of backfill material was performed using the small bulldozer used for backfill placement. In addition, following backfilling, several pipe trenches were compacted using a hand-operated mechanical compactor.

ATEC were retained by CWM to perform compaction testing on backfilled areas. If the results of compaction testing indicated that a compacted area failed to meet 95 percent of the maximum dry density, the area was re-compacted and re-tested for compaction until satisfactory compaction was achieved.

3.4.2 Backfilling and Surface Restoration

Backfilling of excavation area A was performed immediately following confirmation, based on the results of PCB screening analyses, that an area achieved cleanup criteria. Since much of area A was used by both Terra and CWM as an access roadway area for vehicles, the subgrade material backfilled into Area A was a coarse roadbase material, consisting of coarse sand with a moderate stone content. The roadbase material was placed in nominal 6-inch layers, and compacted with a Dresser vibrating drum roller. Following placement and compaction of the roadbase material, approximately one foot of crushed limestone was placed and compacted on top, to provide a firm base for vehicular traffic.

Excavation area B and portions of area C along the driveway area adjacent to Superior's facility could not be backfilled for several weeks following completion of excavation in these areas, due to the presence of several inches of snow and meltwater. Where possible, meltwater was pumped from the open excavation to be treated at the on-Site water treatment facility. Area B was backfilled with a sandy common fill material to provide a minimum of six inches of clean cover material until Site conditions were suitable for placement of topsoil.

In area C along the driveway area adjacent to Superior's facility, and in Superior's truck parking area to the north, coarse sandy roadbase material was placed and compacted in nominal 6-inch layers, then covered with a minimum of six inches of 1-inch and 2-inch diameter crushed limestone. At several locations in the deep pipe trenches extending across Superior's parking area, where wet soil existed at the base of the excavation, approximately one to two feet of 2-inch diameter crushed stone was placed to provide a suitable base for placement of granular backfill material. Roadbase material was then backfilled over the stone in approximately 1-foot lifts and compacted using a hand-operated mechanical compactor. Upon nearing original grade, where appropriate, a minimum of six inches of crushed stone was placed and compacted over the driveway and parking lot area.

Following excavation and confirmatory sampling of the grassed portions of areas C4 and C5 immediately adjacent to Superior's facility, these areas were backfilled with common fill material, and where appropriate, topsoil was placed to bring the areas to grade and the areas were re-seeded with grass. As requested by Superior, the former grassed areas adjacent to the northern side of Superior's building east of the loading dock were re-surfaced with crushed limestone. In addition, Superior's loading dock, which was dismantled in order to excavate Pipe 30, was reconstructed with a new concrete slab and floor drain, and concrete retaining walls were also constructed.

Backfilling of area D in the vicinity of the former plant slab proceeded, in general, from south to north concurrent with excavation of the plant slab. Backfilling of the former plant slab area to the southern limit of the Phase II interim storage cell was completed by mid-April, 1989, and topsoil placement and grass seeding and mulching were completed by late June 1989. Seeding in this area was performed by CWM, using a hand-operated rotary bag seeder. Straw mulch was placed by hand, over the seed. Following removal of the concrete plant slab in the former area of the Phase II interim storage cell and excavation of the underlying soil, clean imported backfill material was placed in this area to approximately the southern limit of the Phase I interim storage cell.

Upon removal of the remainder of the concrete plant slab and underlying soil in the vicinity of area D32 and the Phase I interim storage cell, as detailed in other sections of this report a large deep excavation remained. This area was backfilled gradually, as excavation proceeded east from area D6 to approximately sub-area D32A south of the former plant production well. Due to the significant depth of the excavation, and the steepness of the excavation sidewalls, it was necessary to backfill the area by constructing a ramp down into the excavation using clean imported backfill material. Trucks delivering backfill to the Site initially dumped backfill material down the side of the excavation sidewall, and the material was graded down into the excavation using the bulldozer. Following placement and grading of several initial loads of backfill, the bulldozer was able to construct ramps down into the excavation, which were at least partially accessible by the dump trucks delivering backfill. As additional backfill material was placed, the slopes of the access ramps were improved to the extent that trucks delivering backfill to the Site could travel further down the ramps prior to dumping . The Dresser roller was used to compact the placed backfill material. The majority of the deep excavation areas, as shown on Plan 5 were backfilled in this manner.

Following completion of backfilling and topsoil placement over the northern portion of the former concrete plant slab area, on October 31, 1989 a local grass seeding contractor seeded the area using a plug seeder unit. The area was then covered with straw mulch, concurrent with the mulching activities performed over the hydroseeded areas of the ravine, as detailed herein.

The placement of stone along the ravine invert, and topsoil along the eastern and western ravine banks in the areas between approximately Station 14+00 and Station 20+00, and between Little Sugar Creek and Station 7+00 was completed by early November, 1989. In addition, topsoil was placed along the eastern ravine bank between Station 7+00 and Station 14+00.

On November 6, 1990, Turfscape, a hydroseeding company, located in Indianapolis, commenced preparation of the topsoiled portions of the ravine banks from Little Sugar Creek to Station 7+00, and from Station 14+00 to Station 20+00, for hydroseeding. At several particularly steep areas along the ravine banks, a degradable wood-fiber blanket was installed to provide a surface which the hydroseed could adhere to, and also to provide a protective moisture barrier once the grass seed germinated. Over the ravine banks between Station 14+00 and Station 20+00, dry straw mulch was broadcasted from a turret-mounted spray applicator on a truck, to provide a surface for the hydroseed to adhere to and also to provide a protective cover. Due to the physical limitations of broadcasting dry straw mulch from the top of the ravine down to the excavated portion of the ravine banks between Little Sugar Creek and Station 7+00, it was decided not to apply the straw mulch in these areas, but apply an extra heavy layer of hydroseed in the area. On the evening of November 6, 1989, excavated portions of the ravine banks between Little Sugar Creek and Station 7+00 were hydroseeded using a hand-held spray applicator. A turret-mounted spray applicator on a truck was then used to hydroseed the ravine banks from Station 14+00 to Station 20+00. Winter wheat was added to the grass seed mixture to facilitate establishment of a vegetative root mat in the early spring, and therefore minimize erosion.

Demobilization activities at the Site, as detailed in Section 3.5, were completed by April 1990. However, on August 20, 1990, CRA and a small crew from CWM remobilized to the Site to complete surface restoration of areas not completed prior to temporary project shutdown. This work included minor regrading of imported fill materials placed over the northern portion of the Site to promote positive drainage, the placement of a nominal six inches of topsoil over areas not previously seeded with grass, planting grass seed and applying mulch over seeded areas. Drainage swales consisting of synthetic filter fabric material covered with a layer of 2-inch diameter crushed stone and overlain by a layer of large rock, were constructed at three locations along the slopes of the western ravine bank between Station 7+00 and Station 10+00, to minimize erosion of the ravine bank. Surface restoration activities related to the Phase III Removal Action at the Site were completed on August 31, 1990.

Final grade contours and details of the surface restoration activities are shown on Plan 7 and Plan 8, respectively.

3.5 DEMOBILIZATION AND PROJECT CLOSE-OUT

Due to the proximity of the contaminated low-lying sand seam to Terra's building, as detailed in Section 3.3.3.7, it was necessary to temporarily discontinue Phase III Removal Action activities at the Site prior to finalizing arrangements for the removal of contaminated material beneath and adjacent to Terra's building. After finalizing arrangements for removal of contaminated material beneath and adjacent to the building, the Phase III Supplemental Removal Action continued at the Site commencing in February 1993, as detailed in Section 4.0.

Demobilization consisted of the decontamination and off-Site removal of equipment and facilities mobilized and/or constructed for use in performance of the Phase III Removal Action.

Since on-Site treatment of wastewater was no longer necessary, the 2,000-pound GAC unit and bag filtration unit were dismantled and removed from Site on February 20, 1990. The activated carbon from the GAC unit, was consolidated with the PCB contaminated soils and disposed of at CWM's chemical waste landfill located in Emelle, Alabama. The remaining 23,000 gallon feed tank (frac tank) was decontaminated by pressure washing, and was removed from Site on April 5, 1990; the other 23,000-gallon frac tank was pressure washed and removed from Site earlier in the project. Prior to pressure washing the interior of the frac tanks, sediments were removed from the tanks manually using hand shovels. The two 6,000 gallon polyethylene tanks used for storage of treated wastewaters were decontaminated by pressure washing and were removed from Site on April 10, 1990.

On February 13, 1990 remaining sections of the Site security fencing were removed to provide access to the Clean Zone for the removal of crushed stone previously placed during the beginning of the project to construct the vehicle access roadways. The Site security fencing located on the eastern side of the ravine area was also dismantled and removed. Fence posts existing within the boundaries of the excavation areas were removed concurrent with excavation activities, and were disposed of with the contaminated soils. Fence posts located outside the limits of excavation on the eastern side of the ravine were cut at ground level, and disposed of at CWM's sanitary landfill located in Danville, Indiana. The fence fabric was removed, pressure washed on the decontamination pad and given to Superior.

Removal of the office trailers was initiated on February 22, 1990 with the removal of WAL's on-Site laboratory, and was completed on February 27, 1990 with the removal of the personnel decontamination trailer. The CRA office trailer was left on Site until completion of the Phase III Supplemental Removal Action, as detailed in Section 4.0.

The truck weigh scales were decontaminated and removed from Site on March 15, 1990. PCBs were not detected in concrete chip samples collected by CWM from the cleaned surface of the concrete foundation of the weigh scales, therefore indicating that the concrete was suitable for off-site disposal at a sanitary landfill. Accordingly, the concrete rubble from the dismantled weigh scale foundation was removed from Site for disposal at CWM's sanitary landfill located in Danville, Indiana.

CWM's heavy construction equipment, including the trackhoes, loaders, and bulldozers, were decontaminated by pressure washing and removed from Site between December 20, 1989 and April 11, 1990, as required, when the equipment was no longer required on Site. In addition, small pieces of equipment and tools were decontaminated by pressure washing prior to removal from Site.

The concrete decontamination pad was secured and covered with a sheet of 20-mil HDPE to prevent precipitation from entering the sump in the decontamination pad.

On April 16, 1990 the final roll-off box containing PCB contaminated solid material was removed from Site for disposal at CWM's chemical waste landfill located in Emelle, Alabama.

Between March 20, 1990 and March 26, 1990, following completion of backfilling activities in areas west and north of the former plant production well, the remaining approximately 450 feet of 6-inch diameter PVC drainage pipe was installed to provide drainage from Terra's loading dock to the ravine area, as shown on Plan 8. Installation of this section of drainage pipe was initiated at the revised pipe discharge location located at the top of the western bank of the ravine area near Station 5+25. To prevent the pipe trench sidewalls from collapsing during pipe installation a steel trenching shield was installed in the pipe trench during pipe installation. The 6-inch PVC pipe was installed at an average grade of 0.63 percent, to provide positive drainage from Terra's loading dock to the ravine area.

Sampling, excavation and disposal of the imported gravel placed adjacent to the truck weigh scales, Clean Zone and truck turnaround area during mobilization activities comprised the final phase of the project closeout. PCB analytical results obtained from surficial gravel samples collected by CRA from the access road and truck turnaround areas west and north of the Clean Zone contained residual concentrations of PCBs less than 50 mg/kg, due to cross-contamination from construction equipment and vehicular traffic. Surficial gravel adjacent to the weigh scales, Clean Zone and truck turnaround area was excavated, and between February 28, 1990 and March 21, 1990 a total of 25 truck loads of residually contaminated gravel and clean concrete from the weigh scale foundation as noted previously, were removed from Site for disposal at CWM's sanitary landfill located in Danville, Indiana, as arranged for by CWM. A copy of the waste profile form and the bills of lading for the residually contaminated gravel and the concrete rubble disposed of at the sanitary landfill are presented in Appendix F.

PCB analytical results received from additional gravel samples collected from the surface of the access road adjacent to Terra indicated that the majority of the samples did not contain detectable concentrations of PCBs, and two samples contained PCBs at a concentration of 1 mg/kg. Therefore, since the surficial gravel at these locations did not contain PCBs at concentrations exceeding 1 mg/kg, the gravel along the access road adjacent to Terra was left in place.

At several locations, such as the area within the office trailer compound where all gravel materials were to be removed to restore the Site to original condition, following removal of the residually contaminated surficial gravel the underlying potentially clean gravel was excavated, stockpiled, and the stockpiled material was sampled. Samples collected from three stockpiles of potentially clean gravel excavated from the area within the office trailer compound and from the northern portion of the truck turnaround area at the northern portion of this Site did not contain detectable concentrations of PCBs. A portion of this gravel material was therefore used as gravel cover material for surface restoration following during the Phase III Removal Action activities, while the remaining stockpiled gravel material was used predominantly for backfill and surface restoration activities during the Phase III Supplemental Removal Action activities, as discussed in the Section 4.0.

3.6 FORMER PLANT PRODUCTION WELL REHABILITATION

Previous attempts to collect representative groundwater samples from the former plant production well were unsuccessful due to the presence of a significant level of iron bacteria in the well and clogging the well screen.

On February 14, 1990, Layne Northern, Inc. (Layne) located in Indianapolis, Indiana initiated rehabilitation measures to clean and remove iron bacteria in the former plant production well, for subsequent collection of representative groundwater samples from the well. Details of the well rehabilitation and sampling are presented in the report entitled "Additional Data Collection Report, Groundwater and Little Sugar Creek Sediment Sampling, Former P.R. Mallory Plant Site, Crawfordsville, Indiana", dated October 1993 and prepared by CRA.

Subsequently, a sample of the well rehabilitation purge waters, which contained sodium hypochlorite and muriatic acid, was collected from the polyethylene containment tank and submitted to CWM's Vickery, Ohio deep well injection facility for waste characterization and approval for disposal. Following receiving disposal approval, on April 6, 1990 the well rehabilitation waters, totalling 5,464 gallons, were removed from Site for disposal at CWM's Vickery, Ohio facility. A copy of the waste profile form and bill of lading for the well rehabilitation waters are presented in Appendix G.

3.7 ON-SITE OBSERVERS

USEPA and IDEM shared oversight responsibilities during the Phase III Removal Action. Either a USEPA or IDEM representative was on Site during all major construction activities, including soil excavation, ravine sediment excavation, loading of trucks with contaminated material for off-Site disposal, wastewater treatment, surface restoration activities, borehole installations, and project demobilization. In addition, representatives were also on Site during soil sampling, observation well sampling and during the rehabilitation of the former plant production well.

In general, IDEM performed project oversight on Sundays through Tuesdays, and the USEPA performed oversight on Wednesdays through Saturdays. For performance of the majority of oversight activities during the Phase III Removal Action, USEPA retained the firms Metcalf and

Eddy, Inc., and Roy F. Weston, Inc., and IDEM retained American Environmental Corporation.

3.8 HEALTH AND SAFETY

3.8.1 General

Due to the potentially hazardous nature of the known on-Site contaminants, a stringent Health and Safety program was implemented during the Phase III Removal Action. The Health and Safety Program was implemented in accordance with the guidelines established in the Phase III RAP and Phase III SOP.

CWM utilized several different personnel to act as the on-Site Health and Safety Officer during the Phase III Removal Action. These personnel included Kevin Staton, Ken Staton, Peter Conroy, Kelly Herndon, Todd Teets, and Matt Littell.

On January 10, 1989, prior to commencing on-Site work which involved the handling of potentially contaminated materials, CWM conducted a project health and safety indoctrination session for Site personnel. During the session, personnel were provided with a brief history of the Site and an outline of the previous two work phases performed at the Site. In addition, personnel were informed of the potential hazards associated with the work, and were made aware of on-Site contingency plans, and health and safety protocols and security procedures required during the removal activities. CWM's Site specific health and safety plan was also reviewed. Additional personnel who arrived on the Site at various times during the Phase III Removal Action were provided similar health and safety training sessions on an individual basis.

All personnel working on Site were required to have had full medical surveillance within two months preceding entry to the Site. Medical surveillance performed was consistent with the approved Phase III SOP.

3.8.2 Work Areas

Prior to commencing on-Site activities, initial limits of the Clean Zone, Exclusion Zone, and Contamination Reduction Zone, were established based on known Site conditions and available analytical data. The initial limits of the work zones are shown on Plan 4. Snow fencing and caution flagging were installed to clearly define the limits of each zone.

Temporary snow fencing installed during Phase II activities and remaining around the upgradient portion of the ravine area was re-installed or upgraded as necessary, to limit unauthorized access to potentially contaminated material. Snow fencing was also erected along the top of the western ravine bank adjacent to the truck turnaround area north of the Clean Zone to provide a physical barrier preventing unauthorized personnel from entering the downgradient portion of the ravine.

Snow fencing was installed around excavation area B adjacent to State Road 32 from the existing Site security fence to the road shoulder and adjacent to the highway, in order to prevent highway traffic from travelling on the contaminated portion of the road shoulder.

At excavation areas A and C adjacent to Terra's and Superior's facilities respectively, snow fencing was erected immediately prior to excavation of a given area to define Temporary Exclusion Zones. Upon achieving cleanup criteria within a sub-area of area A and C, the areas were backfilled as soon as possible, and the temporary fencing relocated to another area where excavation would be performed. By proceeding in this manner, vehicular access adjacent to each facility was maintained. Excavation activities within the Temporary Exclusion Zones were performed in such a sequence that vehicles or personnel did not track onto clean areas following contact with a potentially contaminated area.

As the project progressed and excavated areas were backfilled with clean material, the boundaries of the Exclusion Zones or

Temporary Exclusion Zones, as defined by fencing or caution flagging, were revised as appropriate, to facilitate surface restoration activities and to provide more convenient access around clean areas of the Site.

As the original Site security fence was dismantled during the progression of excavation activities, the fence fabric was pressure washed on the decontamination pad and, at the request of Superior, visibly clean portions of the fabric were given to Superior. In addition, as the fence posts were removed a number of posts from clean areas of the Site were pressure washed and given to Superior. All other fence fabric and fence posts were either pressure washed and disposed of at CWM's sanitary landfill located in Danville, Indiana, or disposed of at CWM's Emelle, Alabama, chemical waste landfill depending on the feasibility of removing potentially contaminated material from the fencing materials.

3.8.3 Development of Off-Site Contingency and Emergency Response Plan

An off-Site contingency planning meeting was conducted on December 21, 1988 with representatives of Crawfordsville Fire Department, Culver Union Hospital, Crawfordsville Police Department, Montgomery County Civil Defense, Indiana State Police, the Mayor of Crawfordsville, Montgomery County Health Department, Superior, IDEM, CWM, and CRA.

The purpose of the meeting was to:

a) introduce key Site personnel to local authorities;

b) review the history of the Site and work completed to date;

c) review the work plan for the Phase III Removal Action;

d) identify materials and contaminants to be handled at the Site; and

e) identify potential hazards and emergency situations which may occur and which local emergency personnel may be required to respond to, and to identify procedures to be followed by on-Site personnel and emergency personnel in response to an emergency situation.

Telephone numbers and key personnel were identified for each agency and a chain of command was established to determine who would direct and coordinate activities and personnel in the event of an emergency.

Fire fighters and ambulance crews from Crawfordsville Fire Department visited the Site and were given a Site tour. The purpose of the tour was to familiarize emergency crews with the Site, in the event that they were required to respond to a fire or accident.

3.8.4 Personal Protective Equipment

Personnel entering the Exclusion Zone and personnel involved in the decontamination of trucks and equipment in the Contamination Reduction Zone were equipped with Level C personal protective equipment, including liquid resistant, splash resistant, full coverage tyvek coveralls and full-facepiece air purifying respirators equipped with dual organic vapor and particulate cartridges, as outlined in the Phase III SOP. On several occasions when it was necessary for CRA personnel to perform surveying activities within the Exclusion Zone, a half-face respirator was worn.

When Site conditions were extremely wet, such as following heavy rainfall when it was possible that on-Site personnel could come into contact with PCB-contamination in liquid form, Saranex or polyethylene coated tyvek coveralls were worn. During dry periods in the summer when elevated temperatures were experienced at the Site, uncoated tyvek disposable coveralls were worn by on-Site personnel in order to minimize the potential for heat stress.

During surface restoration activities and work in clean areas of the Site, Level D personal protective equipment, including safety shoes, safety glasses, and a hard hat were worn.

3.8.5 On-Site Air Monitoring

3.8.5.1 General

During on-Site activities which involved the excavation or loading of PCB contaminated soils, air quality was monitored in and around the active work location. In general, air monitoring included fixed-media air monitoring for total suspended particulates (TSP) and PCBs, and direct-readout air monitoring for respirable dust, explosive gases, and organic vapors.

The results of the on-Site air monitoring were provided to the on-Site Agency representative, in general, on a weekly basis. Details of the on-Site air monitoring activities are presented in the following sections.

3.8.5.2 Fixed-Media Air Monitoring

Fixed-media air monitoring was performed on a daily basis during contaminated soil excavation and loading activities, using Gillian and SKC air sampling pumps fitted with filter cassettes for TSP and particulate phase PCBs and florisil tubes for vapor phase PCBs.

Initially air monitoring stations were established at 15 locations spaced at approximately equal intervals along the perimeter Site security fence, such that air leaving the Site could be monitored effectively. In mid-October 1989, when the areas of contaminated soil excavation were confined mainly to the northern portion of the Site the locations of the perimeter air monitoring stations were revised to more appropriately represent perimeter locations upwind and downwind of the excavation areas. When performing fixed-media air sampling one set of sampling pumps (one pump for TSP, and a second pump for particulate phase PCBs and vapor phase PCBs) was installed at an air monitoring station upwind of the location of the excavation activities proposed for that day, and two sets of sampling pumps were installed at air monitoring stations located downwind of the excavation activities. A fourth set of sampling pumps was installed at a location within an excavation area or truck loading area which was considered to be representative of the location of the maximum risk personnel (maximum risk based on potential exposure to airborne PCB vapors or particulates).

In general, the sampling pumps were operational for approximately six hours to eight hours per day during contaminated soil excavation or loading activities. However, in the event of the onset of significant precipitation the air sampling was discontinued in order to prevent damage to the pumps or the sampling media. In these instances, the duration of the fixed-media air sampling was decreased, at times, to four or five hours or less. On some days when the Site was damp due to precipitation and additional precipitation was forecasted, fixed-media air sampling was not performed since suspended particulates would not be expected to present a hazard, and since the dampness or precipitation may damage the sampling pumps. Fixed-media air sampling was not performed on days when contaminated soil excavation or loading activities were not performed.

During the Phase III Removal Action, a total of 802 samples (excluding daily field blanks) were collected from locations downwind of excavation or soil loading locations and at locations representative of maximum risk personnel, and were analyzed for TSP. Of these samples, 60 samples showed an excursion of 150 micrograms per cubic meter ($\mu g/m^3$) TSP or greater between the upwind and downwind or maximum risk samples, and in accordance with the Phase III RAP, were analyzed for PCBs. Of the 60 samples analyzed for PCBs, PCBs were detected in 26 of the samples, at low concentrations ranging from 0.37 $\mu g/m^3$ to 29.0 $\mu g/m^3$. Of the 26 samples which contained detectable concentrations of PCBs, in 25 of the samples the detected PCB aroclor was aroclor 1016; in one sample the detected aroclor was aroclor 1242.

The Occupational Safety and Health Administration (OSHA) does not specify a permissible exposure level (PEL) for PCB aroclor 1016 in air. However, based on the PELs of 500 $\mu g/m^3$ (54 percent chlorine) and 1,000 $\mu g/m^3$ (42 percent chlorine) established by OSHA for PCBs in air, the Phase III Removal Action activities did not cause significant exposure to on-Site personnel, the general public or the environment.

In the 802 air samples collected downwind of excavation or soil loading locations or at locations representative of maximum risk to airborne contamination, where detected, TSP concentrations ranged from 5 $\mu g/m^3$ to 988 $\mu g/m^3$, therefore well below the PEL of 15,000 $\mu g/m^3$ established by OSHA for total nuisance dust.

3.8.5.3 <u>Direct-Readout Air Monitoring</u>

Direct-readout air monitoring was performed, in general, on an hourly basis between 9:00 a.m. and 3:00 p.m. during contaminated soil excavation and loading activities. Air monitoring for measurement of respirable dust, explosive gases, and organic vapors was performed using a Sibata digital dust indicator, a Gastech explosimeter, and an HNu meter, respectively. The direct-readout air monitoring activities were performed at the same locations as the fixed-media air monitoring pumps, as indicated in Section 3.8.5.2.

Results of air monitoring for respirable dust indicated TSP concentrations in the range of 1 $\mu g/m^3$ to 189 $\mu g/m^3$. Typical concentrations of TSP detected in the samples representative of the locations downwind of excavation and loading activities and the maximum risk personnel, were in the range of 20 $\mu g/m^3$ to 40 $\mu g/m^3$. These concentrations are well within the PEL of 5,000 $\mu g/m^3$ for respirable dust as established by OSHA.

Results of air monitoring for explosive gases indicated that in all cases the lower explosive limit (LEL) was normal at 0.0 percent.

Results of air monitoring for organic vapors measured at breathing height upwind and downwind of the excavation and loading areas or at locations representative of the maximum risk personnel, were either not detected on alternatively were detected at concentrations less than or equal to 1 ppm which, in general, was representative of background concentrations.

Based on the results of the direct-readout air monitoring performed, the Phase III Removal Action activities did not cause significant exposure to on-Site personnel, the general public, or the environment.

4.0 PHASE III SUPPLEMENTAL REMOVAL ACTION

4.1 GENERAL

As discussed in Section 3.3.3.7, on December 6, 1988 excavation activities to the depth of the low-lying sand seam adjacent to Terra's building were temporarily discontinued due to the close proximity of Terra's building. Upon discontinuing excavation activities, PCBs at concentrations ranging from 36 mg/kg to 37,000 mg/kg remained in the low lying sand seam adjacent to the building.

As detailed in the Phase III SAR, a subsurface soil sampling program was conducted at the Site between December 1988 and June 1992 to determine the areal and vertical extent of PCB contamination adjacent to and beneath Terra's building. Analytical results received from subsurface soil samples collected from vertical boreholes drilled approximately five feet east of Terra's building demonstrated that over the majority of the area sampled, PCB contamination in the sand seam had not migrated to the west as far as the building, and that the silty clay material overlying the saturated sand seam did not contain PCBs at detectable concentrations. However, elevated concentrations of PCBs were detected in the sand seam within an area five feet east of the building and approximately 115 feet south of the northern limit of the building. PCB concentrations of 135,000 mg/kg and 157,000 mg/kg were detected in the sand seam over a limited area adjacent to the building. Subsequent boreholes drilled at an angle beneath the building demonstrated that PCBs at concentrations exceeding the cleanup criterion existed in the sand seam over an area approximately 15 feet wide and approximately 14 feet beneath Terra's building.

A work plan entitled "Supplemental Work Plan, Removal of Contaminated Material Beneath and Adjacent to Terra Products Facility, Former P.R. Mallory Plant Site, Crawfordsville, Indiana" (Phase III Supplemental Work Plan) dated February 1990 and prepared by CRA, was developed to address the removal of these materials by an open excavation method with shoring installed to support Terra's building. At the request of

Terra, additional options for removal of the contaminated material beneath the building, including removal by horizontal augering, were investigated. However, due to the substantially increased costs and risks associated with the removal of the contaminated material by the horizontal augering method, it was determined that this option was not feasible.

In the fall of 1990, Kraft were advised of Terra's intention to relocate their manufacturing operations to a new location by approximately September 1991, following which Kraft would have unhindered access to perform the additional removal activities beneath and adjacent to the building. After finalizing a formal access agreement between Kraft and Terra, in June 1992 Kraft were advised of Terra's intention to sell their facility. In June 1992 Terra sold the tract of the property associated with the removal activities to Servies Enterprises.

An access agreement between Servies Enterprises and Kraft was finalized, and in February 1993 the Phase III Supplemental Removal Action activities commenced at the Site. The Phase III Supplemental Removal Action activities were performed in accordance with the Phase III Supplemental Work Plan. In general, the Phase III Supplemental Removal Action comprised dismantling of a portion of Terra's building overlying the contaminated sand seam, installation of shoring, excavation of clean overburden material, excavation and disposal of contaminated material, backfilling, building reconstruction, and surface restoration.

USEPA and IDEM shared oversight responsibilities during the Phase III Supplemental Removal Action. USEPA and IDEM representatives were on Site on a periodic basis during building dismantling and reconstruction activities, shoring installation, clean overburden excavation, and backfilling and surface restoration activities. USEPA representatives were on Site on a full-time basis during contaminated soil excavation activities. Oversight activities on behalf of USEPA were performed by representatives of the firm Ecology and Environment Inc.

Details of the Phase III Supplemental Removal Action are presented in the following sections.

4.2 BUILDING DISMANTLING

Moore Building Co., located in Crawfordsville, were retained to perform the building dismantling activities. The building dismantling activities were completed between February 8, 1993 and March 11, 1993.

In general, a 45-foot long section was dismantled and removed from the central portion of Terra's easternmost building. The building was dismantled across the entire approximately 54-foot span to facilitate complete removal of the roof trusses. The western and northern building walls were left in place. A temporary end wall constructed of wooden framing and covered with polyethylene sheeting was constructed at the southern limit of building dismantling to prevent precipitation from entering the building. The northern building wall (building interface) was covered with polyethylene sheeting to prevent weather damage to the wall. A 30-foot by 35-foot section of the concrete building floor was removed to facilitate shoring installation and excavation of the underlying soils.

4.3 SHORING INSTALLATION

Rust Remedial Services (Rust) (formerly Chemical Waste Management) were retained to perform the shoring installation activities and soil excavation and backfilling activities. Beaty Construction Inc. (Beaty), located in Boggstown, Indiana were retained by Rust as a sub-contractor to perform the shoring installation and removal activities. Shoring installation activities commenced on March 9, 1993, and were completed by April 21, 1993 concurrent with the clean overburden excavation activities performed by Rust. The limits of the shoring installations are shown on Plan 4.

Shoring installation commenced with the installation of steel H-piles at distances approximately eight feet apart, along the estimated maximum areal limit of contaminated soil excavation. The steel H-piles were installed to a total depth of approximately 33 feet below grade using a crane-mounted pile driver with a mechanical hammer.

Following installation of the H-piles horizontal wooden lagging was installed manually between the H-piles by Beaty personnel, concurrent with the excavation of clean silty clay overburden material performed by Rust. Following installation of the wooden lagging to a depth of approximately ten feet below grade, steel cable tie-backs were installed through the wooden lagging and were grouted into the undisturbed soils beneath the building. The tie-backs were installed between the steel H-piles at distances of approximately eight feet apart. Steel whalers were welded in place between the H-piles, and subsequently, tension was applied to the cable tie-backs.

The purpose of the cable tie-backs was to further support the steel H-piles and wooden lagging from collapsing inwards. Tension testing of the tie-backs, performed by Beaty, indicated that the tie-backs exhibited satisfactory tension at locations within the limits of the dismantled portion of the building. However, tension testing of the tie-backs at locations immediately east of the building indicated that these tie-backs did not exhibit sufficient tension to satisfy the design requirements of the shoring system. Additional attempts to mechanically increase the tension on the tie-backs failed, and accordingly, it was necessary for Beaty to complete a supplemental shoring design for shoring locations east of the building. The supplemental shoring design required that a steel sheet pile wall be installed approximately four feet east of the steel H-pile and wooden lagging shoring east of the building. Between April 14, 1993 and April 21, 1993, the sheet piling wall construction was completed. The sheet pile wall comprised a continuous wall of interlocking steel piles, installed to a depth of 36 feet below grade.

During soil excavation and removal activities, as discussed in Section 4.4, a Beaty employee remained on Site on a full-time basis to monitor the shoring and further confirm that adequate support of the building was maintained.

Following completion of soil excavation activities and concurrent with backfilling activities, the wooden lagging was removed in lifts as backfill was placed in the excavation. The cable tie-backs were severed at the shoring wall, and the portions of the tie-backs installed in the undisturbed material beneath the building were left in place. The steel H-piles and sheet pile wall were removed using a large crane. Two steel H-piles, one located along the western shoring wall within the limits of the building and the other located east of the building, could not be removed from the ground, presumably due to bending of the H-piles at depth during installation. These H-piles were cut off approximately five feet below grade, and were left in place.

4.4 EXCAVATION ACTIVITIES

4.4.1 Clean Overburden Excavation

As detailed in the Phase III SAR, subsurface soil sampling indicated that the silty clay material overlying the contaminated sand seam did not contain detectable concentrations of PCBs. Accordingly, the silty clay overburden material was excavated and stockpiled to be used as backfill material following completion of excavation.

Prior to excavation of the clay overburden material, approximately 12 inches of surficial crushed stone was removed and stockpiled using a large rubber-tired loader. This material was intended to be used for surface restoration following completion of backfilling. Plastic safety fencing was then erected around the perimeter of the proposed excavation area to prevent unauthorized entry to the excavation and to define the limits of the Exclusion Zone for when excavation of contaminated material commenced.

Overburden excavation activities were performed using a Link-Belt 3400 trackhoe with an extended hydraulic arm to give the trackhoe a 60-foot reach. During excavation of the silty clay overburden material the trackhoe was positioned east of the dismantled portion of the building.

As the clay overburden material was excavated the rubber-tired loader was used to stockpile the clay material on polyethylene sheeting on the grassed area of the Site east of the excavation area.

The clay overburden material was staged in three separate stockpiles, to be further sampled and analyzed for PCBs prior to use as backfill. Stockpile A was representative of the uppermost approximately 10 feet of silty clay overburden soils, and Stockpiles B and C were representative of silty clay overburden soils excavated from depth intervals of approximately 10 feet to 12 feet below grade and approximately 12 feet to 14 feet below grade, respectively. PCB analytical results obtained from composite soil samples collected from the excavated overburden stockpiles indicated that Stockpile A did not contain detectable concentrations of PCBs. Stockpile B and Stockpile C contained PCBs at concentrations of 4.7 mg/kg and 3.3 mg/kg, respectively. Accordingly, since the excavated overburden stockpiles did not contain PCBs at concentrations exceeding 10 mg/kg, the excavated overburden soils were suitable for use as backfill material. Additional soil samples were collected from the northern and southern overburden excavation sidewalls to further confirm that the overburden adjacent to terra's building did not contain PCBs at concentrations exceeding cleanup criteria; neither of these two samples contained detectable concentrations of PCBs.

Within the limits of the dismantled portion of the building, the clean overburden was excavated to the full areal limits of the shoring. Outside the limits of the building clean overburden was excavated to the west to the limit of the sheet pile wall east of the building, and east to the limit of the subsurface HDPE liner installed during the Phase III Removal Action to separate contaminated material in the low lying sand seam from clean backfilled material. The excavation sidewalls where shoring was not installed were sloped in accordance with prevailing OSHA regulations. The estimated two feet of silty clay existing beneath the removed overburden and above the contaminated sand seam was excavated and disposed of as contaminated material, to mitigate the potential for intermixing of potentially contaminated soil with clean soil which could be used as backfill.

During excavation of the silty clay overburden material, small quantities of water which ponded within the excavation due to precipitation or infiltration were pumped and discharged to the ground surface east of Terra's building and north of the excavation. Following completion of overburden excavation, potentially contaminated excavation waters were pumped to a 6,000-gallon polyethylene storage tank, to be treated prior to off-Site disposal.

4.4.2 Contaminated Soil Excavation and Removal

During excavation of the contaminated soil, the Link Belt LS-3400 trackhoe with the extended hydraulic arm remained positioned on a benched platform located at the northeastern portion of the excavation, constructed on clean backfill material placed during the Phase III Removal Action activities. From this location, with the extended hydraulic arm the trackhoe could reach all of the areas of proposed contaminated soil excavation, without moving the tracks of the trackhoe.

Contaminated soil excavation activities commenced on April 22, 1993, at the area within the limits of the dismantled portion of the building. The northern and southern limits of excavation of the low-lying sand seam were determined based on the analytical results obtained from soil samples collected from the sand seam during previous borehole installations beneath the building, as discussed in Section 4.1, which demonstrated the areal limits of where the 25 mg/kg cleanup criterion applicable to soils at depths below 3.5 feet below grade was achieved. The entire thickness of the sand seam, approximately two to three feet, and additional underlying contaminated clay material was excavated and removed to the northern and southern limits determined as noted above. Previous borehole sampling did not completely demonstrate the western limit of where PCB contamination exceeded the 25 mg/kg cleanup criterion beneath the building. Therefore, the western limit of excavation was initially determined based on visual observations made during excavation, followed by collection of a soil sample from the sand seam at this location. Analytical results obtained from the soil sample collected from the sand seam at the western limit of excavation indicated that the sample contained PCBs at a concentration of 2.7 mg/kg, therefore well within the 25 mg/kg cleanup criterion. Following completion of the western limit of the sand seam excavation, a confirmatory soil sample was collected from the hard pan material existing at the base of the excavation within the limits of the building. Analytical results received for this sample indicated that the sample did not contain detectable concentrations of PCBs.

Due to the high water content of the excavated contaminated soil it was necessary to temporarily stockpile the material within the excavation below and in front of the trackhoe platform. A berm and sump were constructed adjacent to the stockpile to collect water which drained from the excavated contaminated soil. Water which drained to the sump was pumped to a wastewater storage tank, to be treated and disposed of off Site.

Following dewatering the excavated contaminated soil, the soil was loaded directly into semi-trailers which backed partially down a shallow access ramp located to the northeast of the excavation. For a number of the semi-trailers, following dewatering and loading the soil still appeared somewhat wet. In these instances, dry Portland cement was added directly to the rear of the trailer beds to absorb excess moisture.

During loading of contaminated material into the trailer, a side curtain of polyethylene sheeting was placed over the exterior of the trailer bed so that if contaminated soil fell from the excavation bucket the material would not contaminant the exterior of the trailer. In addition, polyethylene sheeting was placed on the shallow access ramp upon which the trailer backed down, to prevent the underlying clean soil from becoming contaminated from incidental spillage, or from potentially contaminated personnel leaving the excavation.

Following loading, the side curtain was removed from the trailer and the truck proceeded up the access ramp to be weighed on a set of temporary weigh scales installed on Site. Since the truck and trailer did not contact potentially contaminated materials, decontamination by pressure washing was not performed. If the polyethylene side curtain or the polyethylene sheeting on the surface of the access ramp appeared to be dirty, the polyethylene sheeting was removed and placed in the trailer bed to be disposed of with the contaminated soils. New polyethylene sheeting was then used as a side curtain and was also placed on the surface of the access ramp.

Following completion of excavation activities within the limits of the building, excavation activities proceeded to the area immediately east of the building. The southern excavation limit was determined based on analytical data obtained from soil samples collected prior to completion of the Phase III Removal Action activities in early 1990. The eastern excavation limit was established by the location of the HDPE liner installed below grade prior to completion of the Phase III Removal Action activities, to separate the PCB-contaminated sand seam and the clean backfill materials.

Excavation activities outside the limits of the building commenced at the southern limit of excavation and proceeded from east to west until the remaining sand material was visually clean. Analytical results obtained from a soil sample collected from the sand seam material, however, indicated that the sample contained PCBs at a concentration of 110 mg/kg, which exceeded the 25 mg/kg cleanup criterion. The sand seam was therefore excavated further towards the west, by distances of up to approximately eight feet, and was completely removed to the location of the steel sheet pile wall adjacent to the building. Analytical results obtained from samples collected from the sand seam during previous borehole sampling activities confirmed that PCBs were not detected at sample locations in the sand seam approximately three feet west of the sheet pile wall. Therefore, by excavating and removing virtually all of the sand seam to the location of the previous borehole samples, the cleanup criterion was achieved.

As excavation activities continued towards the north outside the limits of the building, excavated contaminated soil was again temporarily stockpiled in front of the excavation platform, to dewater prior to loading. Although the contaminated soil located outside the limits of the building was initially somewhat drier than the material excavated from within the limits of the building, heavy rainfall had caused this material to become excessively wet. Accordingly, in addition to adding dry Portland cement to the beds of the trailers, dry Portland cement was also added directly to the stockpiled contaminated material to solidify the material prior to loading.

A total of four confirmatory soil samples were collected from the hard pan material at the base of the excavation outside the limits of the building. None of the four confirmatory soil samples collected from the base of the excavation outside the limits of the building contained detectable concentrations of PCBs. Accordingly, the excavation was backfilled to grade as detailed in Section 4.5, and split portions of the soil samples collected from the excavation base were composited and analyzed for PCBs by CLP protocols. In total, two composite soil samples from the base of the excavation beneath and adjacent to the building were analyzed for PCBs by CLP protocols. The CLP analytical results indicated that PCBs were detected in the composite soil sample representative of the excavation area within and immediately adjacent to the limits of the Terra building, at an estimated concentration (since reported value was below the method detection limit) of 0.016 mg/kg. PCBs were detected in the composite soil sample representative of the excavation area east of the building at a concentration of 1.9 mg/kg. Based on these analytical results, it was confirmed that cleanup criteria was achieved at areas beneath and adjacent to the Terra building. The total depth of the excavation areas beneath and adjacent to the building varied from approximately 18 feet to 21 feet below grade.

Contaminated soil excavation and loading activities were completed on April 28, 1993. During the Phase III Supplemental Removal Action activities, a total of 20 semi-trailer loads of PCB contaminated soil, representing 457.67 tons, were removed from Site. The contaminated soil was disposed of at the TSCA-regulated cell at CWM's chemical waste landfill located in Emelle, Alabama; the same disposal facility used during the Phase III Removal Action. A copy of the waste profile and Hazardous Waste Manifest form used during the Phase III Supplemental Removal Action, and a summary of the loads of PCB-contaminated solid materials disposed of at the Emelle, Alabama facility, are presented in Appendix B.

4.5 BACKFILLING AND SURFACE RESTORATION

Initial backfilling of the excavation area within the limits of the dismantled portion of the building commenced immediately following receipt of analytical results which confirmed that the cleanup criterion was achieved. Prior to backfilling in this area water which had infiltrated into the excavation from adjacent portions of the remaining sand seam was pumped from the excavation to a polyethylene storage tank. This area was promptly backfilled using clean overburden material from Stockpile A, to approximately one foot above the remaining sand seam to prevent additional water from infiltrating the excavation.

Prior to commencing backfilling within the excavation area outside the limits of the building, rainwater which had accumulated in the excavation was pumped to the polyethylene storage tank. However, due to the wet conditions within the excavation, during placement of the initial lift of backfill material dry Portland cement was added and mixed into the backfill to solidify the material to make a supportive base suitable for placement of additional backfill.

With the exception of the initial layer of backfill material from Stockpile A placed in the excavation area within the limits of the building, excavated overburden material from Stockpile B and Stockpile C was completely used prior to using the material from Stockpile A. The stockpiled overburden was transported to the excavation areas for backfilling, using the rubber-tired loader. The loader was operated carefully in such a manner that residual concentrations of PCBs detected in Stockpile B and Stockpile C were not tracked onto clean areas of the Site during transport. In order to ensure that residual concentrations of PCBs did not remain on the ground surface beneath Stockpile B and Stockpile C, approximately ten inches of material underlying the stockpiles was also removed and placed in the excavation areas as backfill material.

During backfilling of the excavation area outside the limits of the building, approximately 150 cubic yards of clean gravel remaining from surface restoration activities performed during the Phase III Removal Action was mixed with the backfill material from Stockpile B and Stockpile C. This gravel material had previously been used in the access road construction during the Phase III Removal Action, and samples collected from the stockpile indicated that the gravel material did not contain detectable concentrations of PCBs.

The uppermost approximately 10 feet of the excavation was backfilled with soil from Stockpile A, with additional gravel from the gravel stockpile placed near the surface to assist in providing a suitable supportive base for vehicular traffic.

As backfill materials were placed in the excavation using the loader, the backfill was spread using a bulldozer. Following spreading of the backfill a vibrating sheeps-foot compactor was used to compact the backfill in nominal 6-inch lifts. Backfill material placed around Terra's production well located within the excavation was compacted using a manually operated mechanical tamper. At areas within the limits of the building and within the cone of influence of the building footings, backfill was compacted to 100 percent of the maximum dry density of the soil. At locations east of the building and not within the cone of influence of the building footings, backfill was compacted to 95 percent of the maximum dry density of the soil.

ATEC were retained by Rust to perform compaction testing on backfilled areas. If the results of the compaction testing indicated that a compacted area failed to meet the 95 percent or 100 percent compaction standard as required, the area was re-compacted and re-tested for compaction until satisfactory compaction was achieved.

Following completion of backfilling, six inches to 12 inches of imported clean crushed stone was placed over the former excavation area east of Terra's building to provide a suitable travel surface for vehicular traffic. Additional topsoil was imported and placed over the disturbed portions of the grassy area east of Terra's building, and the area was re-seeded with grass seed.

4.6 WASTEWATER TREATMENT AND OFF-SITE DISPOSAL

During the Phase III Supplemental Removal Action, approximately 12,400 gallons of wastewater was generated from the dewatering of the excavation, and the decontamination of miscellaneous tools and equipment on the decontamination pad. In addition, approximately 1,600 gallons of wastewater had been contained on Site during the investigative borehole sampling activities performed during the period between completion of the Phase III Removal Action and commencement of the Phase III Supplemental Removal Action. These wastewaters were comprised of purge waters removed from the monitoring wells and the former plant production well during an additional round of groundwater monitoring performed at the Site in June 1991, and washwaters resulting from the decontamination of drill rig augers during the investigative borehole sampling activities performed at the Site in July 1990 and June 1992.

As of the time of the Phase III Supplemental Removal Action the permitting status of CWM's deep well injection disposal facility located in Vickery, Ohio had changed such that prior to disposal wastewater must be pre-treated through activated carbon, and the maximum allowable concentration of PCBs in the wastewater was 25 mg/L. In order to pre-treat the wastewater, a small wastewater treatment system was installed on the Phase III decontamination pad. The treatment consisted of polyethylene wastewater feed tanks, a bag filter for removal of suspended solids, a 55-gallon granular activated carbon canister and a polyethylene treated wastewater storage tank.

During the Phase III Supplemental Removal Action activities Rust were responsible for the sampling and analyses of the treated wastewaters from the Site. The approximately 12,400 gallons of excavation and decontamination wastewaters were treated, and analytical results from two samples of treated wastewater collected by Rust from two treated wastewater storage tanks indicated that one of the samples did not contain detectable concentrations of PCBs, and one sample contained PCBs at a concentration of 51.5 µg/L, which was well within the 25 mg/L criterion applicable for disposal of the wastewater at the Vickery facility. Subsequently, between June 2, 1993 and June 4, 1993 three tanker loads of treated wastewater, totalling 12,427 gallons, were removed from Site and disposed of at the Vickery, Ohio facility.

In April 1993, Rust inadvertently transferred approximately 15 gallons of spent sampling equipment decontamination waters, which contained deionized water and spent acetone, 1,1,1-trichloroethane, hexane, and methanol, to a wastewater tank which contained excavation waters, monitoring well purge waters, and auger washwaters from prior borehole sampling activities. Since this tanked wastewater was then contaminated with solvents, it was necessary to sample and characterize the wastewater, and dispose of it as a separate waste stream from the other treated excavation wastewaters from the Site. The sampling and characterization of the solvent wastewater was performed by Rust, and it was determined that although the solvent wastewater was considered to be a hazardous waste liquid (F002 and F003 coded) and was a separate waste stream, it could be disposed of at CWM's Vickery, Ohio facility provided that the wastewater was treated on Site through the activated carbon unit and did not contain PCBs at concentrations exceeding 25 mg/L. Results of PCB analysis performed on a sample collected by Rust from the solvent wastewater prior to treatment indicated that the sample did not contain detectable concentrations of PCBs.

The solvent wastewaters, totalling approximately 1,600 gallons, were treated on Site and on June 9, 1993 were transported to CWM's Vickery, Ohio disposal facility. Two samples of the solvent wastewater were collected at the disposal facility and analyzed for PCBs. PCBs were detected in the solvent wastewater samples at concentrations of 55 mg/L and 64 mg/L. Since the wastewaters contained PCBs at a concentration exceeding the disposed criterion of 25 mg/L, the solvent wastewaters were rejected for disposal, and accordingly, were returned to the Site for further treatment to reduce the concentration of PCBs.

Since it was apparent that the concentration of PCBs in the solvent wastewater had increased after on-Site treatment, it was determined that the carbon canister used in the treatment process must have become contaminated with PCBs at elevated concentrations during prior treatment of the excavation waters. Accordingly, the spent carbon in the canister was replaced with new carbon, and the solvent wastewaters were re-treated on Site. A sample collected by Rust from the re-treated solvent wastewater was determined to contain PCBs at a concentration of 594.7 µg/L. As an additional precaution, to ensure that the re-treated solvent wastewaters not rejected at the Vickery, Ohio facility, Rust again re-treated the solvent wastewaters on Site, and forwarded a sample of the re-treated solvent wastewaters directly to CWM's Vickery, Ohio facility for PCB analysis. The sample contained PCBs at a concentration of 0.5 mg/L. Since this second sample of the re-treated solvent wastewaters further confirmed that the wastewaters did not contain PCBs at a concentration exceeding the 25 mg/L disposed criterion, on June 22, 1993 the solvent wastewaters, totalling 1,632 gallons, were removed from Site and disposed of at the Vickery, Ohio facility.

A copy of the waste profile form representative of the excavation wastewaters during the Phase III Supplemental Removal Action and a summary of the excavation wastewaters disposed of at CWM's Vickery, Ohio facility are presented in Appendix A. A copy of the waste profile form and the Uniform Hazardous Waste Manifest for the solvent wastewater are presented in Appendix H.

Following on-Site treatment of the wastewater, wastewater sediments which had accumulated at the bases of the polyethylene wastewater storage tanks were transferred to drums and the interior of the tanks were cleaned by pressure washing; the resulting wastewater was removed from Site with the treated wastewaters. In addition, the spent activated carbon from the carbon canisters was removed from the canisters and transferred to drums along with the wastewater sediments. The drummed sediment and spent carbon was characterized and profiled for disposal by Rust, as a hazardous waste liquid (F002 and F003 coded due to the presence of spent solvents), and were removed from Site for disposal on July 20, 1993. The drummed sediment and carbon was transported to CWM's chemical waste landfill located in Emelle, Alabama to be repackaged into suitable containers, prior to ultimate disposal by incineration at Rollins Environmental Services located in Deer Park, Texas.

A copy of the waste profile form and the completed Uniform Hazardous Waste Manifest form for the drummed wastewater sediment and spent carbon are presented in Appendix I.

4.7 UNUSED DECONTAMINATION SOLVENT

Upon completion of confirmatory soil sampling activities during the Phase III Supplemental Removal Action activities at the Site, approximately three gallons of unused 1,1,1-trichloroethane (1,1,1-TCA) solvent remained on Site. This solvent was excess solvent contained in the original manufacturers 5-gallon steel container, and which was not completely used during the decontamination of sampling equipment.

On May 28, 1993, Rust transported the 1,1,1-TCA solvent to Liquid Waste Removal, Inc. a waste solvent broker located in Greenwood, Indiana, where the solvent would be consolidated with other solvents, and then would be transported to Klor Kleen, Inc. located in Cincinnati, Ohio, for disposal by recycling. Based on communications with USEPA, both Liquid Waste Removal, Inc. and Klor Kleen, Inc. are permitted facilities.

Copies of the bill of lading and shipping order for the 1,1,-TCA are presented in Appendix J.

4.8 DEMOBILIZATION AND PROJECT CLOSEOUT

Demobilization consisted of the decontamination and off-Site removal of equipment and facilities mobilized and/or constructed for use in performance of the Phase III Supplemental Removal Action.

Due to the short duration of Site activities which involved contact with potentially contaminated materials, equipment which required decontamination was limited to the trackhoe used for the excavation and loading of contaminated soil, and a small number of miscellaneous tools.

Although the trackhoe had been situated on clean soil during excavation and loading, as a precaution, the trackhoe was driven across polyethylene sheeting to the Phase III decontamination pad, where the bucket and tracks of the trackhoe were decontaminated by pressure washing. Additional tools, and re-usable personal protective equipment such as heavy rubber overboots were also decontaminated by pressure washing. Wastewaters resulting from the decontamination activities were collected in the decontamination pad sump, and subsequently, were transferred to the polyethylene wastewater storage tanks and treated, as detailed in Section 4.6.

Following completion of decontamination activities, the concrete surface of the decontamination pad and associated sump was pressure washed, and Rust collected chip samples from the concrete for PCB analyses to determine if the concrete could be disposed of at a sanitary landfill. Results of PCB analyses performed on the concrete chip samples indicated that PCBs were not detected. Subsequently, the decontamination pad was demolished, and the concrete rubble was removed from Site and disposed of at CWM's sanitary landfill located in Danville, Indiana. A copy of the waste profile and bill of lading for the concrete rubble are presented in Appendix K.

Removal of the Site office trailers was completed by June 16, 1993. Removal of the temporary overhead power and telephone services, as well as the removal of the majority of Rusts miscellaneous equipment such as the polyethylene wastewater storage tanks and miscellaneous parts and fittings, was completed by July 20, 1993.

As directed by Rust, approximately 50 c.y. of stockpiled clean gravel material remaining from the Phase III Removal Action activities and which was not used for backfill during the Phase III Supplemental Removal Action activities was removed from Site for use as backfill material at a local Crawfordsville facility. Results of prior PCB analyses performed on samples collected from the gravel material indicated that the gravel did not contain detectable concentrations of PCBs.

4.9 BUILDING RECONSTRUCTION

Moore Building Co. were retained to reconstruct the dismantled portion of the Terra building. The dismantled portion of the building was reconstructed to match its original condition, however, several minor modifications to the reconstruction were implemented to comply with applicable building codes.

The building reconstruction activities commenced in early June 1993 and were substantially completed by mid-August 1993.

4.10 HEALTH AND SAFETY

4.10.1 General

Health and safety protocols followed during the Phase III Supplemental Removal Action were generally consistent with the protocols followed during the Phase III Removal Action, and were in accordance with the guidelines established in the Phase III RAP and Phase III SOP.

During the Phase III Supplemental Removal Action Mr. Tom Uhur of Rust acted as the on-Site Health and Safety Officer.

On March 11, 1989, prior to commencing significant on-Site work activities, Rust conducted a project health and safety indoctrination session for Site personnel. During the session, personnel were provided with a brief history of the Site and an outline of the previous work phases performed at the Site. In addition, personnel were informed of the potential hazards associated with the work, and were made aware of on-Site contingency plans, and health and safety protocols and security procedures required during the removal activities. Rust's Site specific health and safety plan was also reviewed.

Rust retained Northwest Security, of Lafayette, Indiana to provide security services on Site during non-working hours and during period of temporary project shutdown, such as weekends or holidays. Security services were initiated commencing clean overburden excavation activities and were maintained until completion of backfilling activities. Throughout the Phase III Supplemental Removal Action, a security guard was on Site at all times when other Site personnel were not present. In general, a security guard was present daily from 4:00 p.m. to 8:00 a.m. on working days, with 24-hour security on non-working days. Except on a limited number of occasions, work activities on Site were performed on Mondays through Saturdays. During a given shift security guards performed regular Site inspections from clean areas of the Site. No significant Site security issues arose during the Phase III Supplemental Removal Action.

4.10.2 Work Areas

Until completion of overburden excavation activities all areas of the Site were considered to be Clean Zones. Upon commencing excavation of the clean overburden soils plastic safety fencing was erected around the perimeter of the proposed excavation area to prevent unauthorized entry to the excavation area. This fencing served to define the limits of the Exclusion Zone following completion of clean overburden removal.

A Contamination Reduction Zone, which included an employee change shed, was set up at a location to the north of the limit of excavation. Potentially contaminated personnel walked on polyethylene sheeting to the Contamination Reduction Zone, to prevent contamination of the underlying clean soils. In addition, a personnel decontamination trailer which housed employee shower facilities was mobilized to a location in the Clean Zone adjacent to the Phase III decontamination pad.

Personnel removed potentially contaminated personal protection equipment at the change shed in the Contamination Reduction Zone, and proceeded to the Clean Zone in standard work uniform.

4.10.3 Development of Off-Site Contingency and Emergency Response Plan

An off-Site contingency planning meeting for the Phase III Supplemental Removal Action was conducted on March 18, 1993 with representatives of Crawfordsville Fire Department, Culver Union Hospital, Crawfordsville Police Department, Indiana State Police, the Mayor of Crawfordsville, Montgomery County Health Department, Servies Enterprises, USEPA, IDEM, Rust and CRA.

The nature of the meeting was, in general, consistent with the Off-Site Contingency Meeting conducted at the beginning of the Phase III Removal Action, as detailed in Section 3.8.3.

4.10.4 Personal Protective Equipment

During the Phase III Supplemental Removal Action the level of personal protective equipment worn by Site personnel was consistent with the level of personnel protection equipment worn by Site personnel during the Phase III Removal Action, as detailed in Section 3.8.4.

4.10.5 On-Site Air Monitoring

4.10.5.1 General

During on-Site activities which involved the excavation or loading of PCB contaminated soils, air quality was monitored in and around the active work location. In general, air monitoring included fixed-media air monitoring for TSP and PCBs, and direct-readout air monitoring for respirable dust, explosive gases, and organic vapors.

4.10.5.2 Fixed-Media Air Monitoring

Fixed-media air monitoring was performed on a daily basis during contaminated soil excavation and loading activities, using SKC personal monitoring air sampling pumps fitted with filter cassettes for TSP and particulate phase PCBs and florisil tubes for vapor phase PCBs.

Air monitoring stations were established at seven locations spaced at approximately equal intervals along the perimeter of the safety fence surrounding the excavation area, such that air leaving the Site could be monitored effectively. When performing fixed-media air sampling one set of sampling pumps (one pump for TSP, and a second pump for particulate phase PCBs and vapor phase PCBs) was installed at an air monitoring station upwind of the location of the excavation activities and two sets of sampling pumps were installed at air monitoring stations located downwind of the excavation activities. A fourth set of sampling pumps was installed at a location which was considered to be representative of the location of the maximum risk personnel (maximum risk based on potential exposure to airborne PCB vapors or particulates).

In general, the sampling pumps were operational for approximately six hours to nine hours per day during the six days of contaminated soil excavation and loading activities.

During the Phase III Supplemental Removal Action, a total of 18 samples (excluding daily field blanks) were collected from locations downwind of excavation or soil loading locations and at locations representative of maximum risk personnel, and were analyzed for TSP. None of these samples, showed an excursion of 150 $\mu g/m^3$ TSP or greater between the upwind and downwind or maximum risk samples, and therefore, in accordance with the Phase III RAP, analysis of the samples was not required. However, as an additional precaution to determine the potential exposure of the maximum risk Site personnel to airborne PCBs, three air samples representative of the maximum risk personnel were analyzed for PCBs. None of these samples contained detectable concentrations of PCBs, therefore, confirming that the Phase III Supplemental Removal Action activities did not cause significant exposure to on-Site personnel, the general public or the environment.

Of the 18 air samples collected downwind of excavation or soil loading locations or at locations representative of maximum risk to airborne contamination, TSP was detected in only one sample, at a concentration of 70 $\mu g/m^3$, therefore well below the PEL of 15,000 $\mu g/m^3$ established by OSHA for total nuisance dust.

4.10.5.3 <u>Direct-Readout Air Monitoring</u>

Direct-readout air monitoring was performed, in general, every one to two hours between approximately 8:30 a.m. and 5:00 p.m. during contaminated soil excavation and loading activities. Air monitoring for measurement of respirable dust, explosive gases, and organic vapors was performed using a HAM (Hand Held Aerosol Monitor) unit, a Gastech explosimeter, and an HNu meter, respectively. The direct-readout air monitoring activities were performed at the same locations as the fixed-media air monitoring pumps, as indicated in Section 4.10.5.2.

Results of air monitoring for respirable dust indicated TSP concentrations in the range of 20 $\mu g/m^3$ to 610 $\mu g/m^3$. Typical concentrations of TSP detected in the samples representative of the locations downwind of excavation and loading activities and the maximum risk personnel, were in the range of 30 $\mu g/m^3$ to 110 $\mu g/m^3$. These concentrations are well within the PEL of 5,000 $\mu g/m^3$ for respirable dust as established by OSHA.

Results of air monitoring for explosive gases indicated that in all cases the lower explosive limit (LEL) was normal at 0.0 percent.

Results of air monitoring for organic vapors measured at breathing height upwind and downwind of the excavation and loading areas or at locations representative of the maximum risk personnel, in all instances, were 0.2 ppm, which was representative of background concentrations.

Based on the results of the direct-readout air monitoring performed, the Phase III Supplemental Removal Action activities did not cause significant exposure to on-Site personnel, the general public, or the environment.

NOTES:

1. AREA II-A PREVIOUSLY EXCAVATED AND COVERED WITH A 40-mil HDPE LINER.
2. AREA II-B PREVIOUSLY EXCAVATED, SECURED WITH A 60-mil HDPE OVERLINER, UNDERLINER, AND BACKFILLED.
3. INTERIM STORAGE CELLS AND CONTENTS COVERED WITH 60-mil HDPE OVERLINERS.
4. STORAGE CELL CONTENTS INCLUDED MIXED SOIL, CAPACITORS, AND DEBRIS FROM EXCAVATION OF AREAS COVERED BY HDPE LINER No. 1 AND HDPE LINER No. 2, AND MISCELLANEOUS DRUMMED WASTES
5. STORAGE CELL CONTENTS INCLUDED SOIL FROM EXCAVATION OF AREA II-A AND AREA II-B
6. STOCKPILED SOIL FROM BOTTOM 1 FOOT OF EXCAVATION FROM AREA II-B
7. CONTAINMENT CELL CONTENTS INCLUDED DEBRIS FROM EXCAVATION OF AREA II-A.
8. NORTH BANK OF LITTLE SUGAR CREEK EAST OF CONFLUENCE OF RAVINE AREA IS APPROXIMATED.

LEGEND

TREE LINE	OW5-86 OBSERVATION WELL	LAMP POST	
TOP OF SLOPE	O/H OVERHEAD POWER LINE	POWER POLE	
STREAM FLOW	PROPERTY LINE		
CREEK BANK	SECURITY FENCE		
	ACCESS GATE		

Nº	Revision	Date	Initial

Approved

PRINTED ON OCT 27 1993

FORMER P.R. MALLORY PLANT SITE
CRAWFORDSVILLE, INDIANA.

PHASE III REMOVAL ACTION REPORT

EXISTING CONDITIONS
NOVEMBER 30, 1988

CRA
CONESTOGA-ROVERS & ASSOCIATES

Drawn by: R.B.B.	Scale: 1"=40'	Date: OCTOBER 1993	File Nº: 81 P-45	Rev.Nº: -
Designed by: J.A.C.				
Checked by: J.A.C.	Field book:	Project Nº: 1916	Drawing Nº: 1	

SEPT 17/93(W)

LEGEND

- OIL ABSORBENT BOOM
- SEDIMENT TRAP
- D13 — SUB-AREA IDENTIFIER
- 2.0 — INITIAL PROPOSED EXCAVATION DEPTH LIMIT (ft)
- A2 H — INITIAL EXCAVATION DEPTH TO BE DETERMINED, PENDING FURTHER INVESTIGATIVE SAMPLING AND ANALYSIS BY ENGINEER
- APPROXIMATE LIMIT OF PROPOSED PIPE EXCAVATION
- A — IDENTIFIER
- PROPOSED SOIL/SEDIMENT SAMPLE LOCATION

NOTES:

1. SAMPLING GRIDS BASED ON SAMPLING AREAS OF APPROXIMATELY 2500 FT^2. SAMPLING AREAS ARE BORDERED BY EXCAVATION LIMITS, EXCEPT AS OTHERWISE DELINEATED BY DOTTED LINES.
2. NORTH BANK OF LITTLE SUGAR CREEK, EAST OF CONFLUENCE OF RAVINE AREA, IS APPROXIMATED.
3. CLEANUP CRITERIA ACHIEVED IN THIS AREA DURING PHASE II ACTIVITIES
4. REMOVE LINER AND GRANULAR FILL COVER FROM PREVIOUSLY EXCAVATED AREA. EXCAVATE 1.0 FT. OF SOIL BELOW BOTTOM OF LINER.
5. ENGINEER MAY DIRECT ADDITIONAL EXCAVATION OF SOIL UNDERLYING DEMOLISHED PLANT SLAB PENDING SAMPLING AND ANALYSIS.

LEGEND

- TREE LINE
- TOP OF SLOPE
- RAVINE FLOW LINE
- CLP COMPOSITE SAMPLE BOUNDARY
- OW5-86 OBSERVATION WELL
- O/H OVERHEAD POWER LINE
- PROPERTY LINE
- SECURITY FENCE
- LAMP POST
- POWER POLE
- ACCESS GATE
- INITIAL PROPOSED LIMITS OF EXCAVATION

Nº	Revision	Date	Initial

Approved

PRINTED ON
OCT 27 1993

FORMER P.R. MALLORY PLANT SITE
CRAWFORDSVILLE, INDIANA.

PHASE III REMOVAL ACTION REPORT

INITIAL PROPOSED EXCAVATION DEPTHS AND CONFIRMATORY SOIL SAMPLE LOCATIONS

CRA
CONESTOGA-ROVERS & ASSOCIATES

Drawn by: R.B.B.	Scale: 1"=40'	Date: OCTOBER 1993	File Nº: P-70	Rev.Nº: -
Designed by: J.A.C.				
Checked by: J.A.C.	Field book:	Project Nº: 1916	Drawing Nº: 2	

SEPT 17/93(W)

NOTES:

1. NORTH BANK OF LITTLE SUGAR CREEK EAST OF CONFLUENCE OF RAVINE AREA IS APPROXIMATED.

LEGEND

- TREE LINE
- O/H — OVERHEAD POWER LINE
- PROPERTY LINE
- OLP LAMP POST
- OPP POWER POLE
- OW5-86 ● OBSERVATION WELL
- ■ CONFIRMATORY PRIMARY SOIL SAMPLE LOCATIONS (CLP)
- ▲ CHECK SAMPLE LOCATIONS (SW-846)
- TOP OF SLOPE
- RAVINE FLOW LINE
- LIMIT OF DEEP EXCAVATION
- LIMIT OF FORMER CONCRETE PLANT SLAB

Nº	Revision	Date	Initial

Approved

PRINTED ON OCT 27 1993

FORMER P.R. MALLORY PLANT SITE
CRAWFORDSVILLE, INDIANA

PHASE III REMOVAL ACTION REPORT

PHASE III CONFIRMATORY SOIL SAMPLE LOCATIONS

CRA
CONESTOGA-ROVERS & ASSOCIATES

Drawn by: R.B.B.	Scale: 1"=40'	Date: OCTOBER 1993	File Nº: 93 P-59	Rev.Nº: -
Designed by: J.A.C.	Field book:	Project Nº: 1916	Drawing Nº: 3	
Checked by: J.A.C.				

SEPT 17/93(W)

NOTES:

1. LOCATIONS OF SITE FACILITIES SHOWN, INCLUDING WASTEWATER TREATMENT SYSTEM, WEIGH SCALES, LABORATORY AND OFFICE TRAILERS ARE REPRESENTATIVE OF THE LOCATIONS OF THESE FACILITIES DURING THE PHASE III REMOVAL ACTION, JANUARY 1989 TO APRIL 1990
2. NORTH BANK OF LITTLE SUGAR CREEK EAST OF CONFLUENCE OF RAVINE AREA IS APPROXIMATED.

LEGEND

- TREE LINE
- TOP OF SLOPE
- STREAM FLOW
- CREEK BANK
- OW5-86 ● OBSERVATION WELL
- STA. 10+00 X RAVINE REFERENCE STATION LINE
- ACCESS GATE
- DEFINES INITIAL PROPOSED LIMITS OF EXCAVATION AREAS A,B,C,D & E
- O/H OVERHEAD POWER LINE
- PROPERTY LINE
- X SECURITY FENCE
- OIL ABSORBENT BOOM
- SEDIMENT TRAP
- OLP LAMP POST
- OPP POWER POLE

Nº	Revision	Date	Initial

Approved

PRINTED ON OCT 27 1993

FORMER P.R. MALLORY PLANT SITE
CRAWFORDSVILLE, INDIANA.

PHASE III REMOVAL ACTION REPORT

SITE PLAN

CRA
CONESTOGA-ROVERS & ASSOCIATES

Drawn by: R.B.B.	Scale: 1"=40'	Date: OCTOBER 1993	File Nº: 80 P-47	Rev. Nº: -
Designed by: J.A.C.				
Checked by: J.A.C.	Field book:	Project Nº: 1916	Drawing Nº: 4	

SEPT 17/93(W)

NOTES:

1.) ALL ELEVATIONS LISTED ARE GEODETIC,BASED ON TEMPORARY BENCHMARK ADJACENT TO TERRA'S LOADING DOCK AT AN ELEVATION OF 792.01' (ASSUMED TO BE 100.00' DURING PHASE III RA). THEREFORE 692.01' HAVE BEEN TO ELEVATIONS ON THIS PLAN
2.) SOME CONTOURS MODIFIED SLIGHTLY OR APPROXIMATED TO MORE ACCURATELY SHOW FINAL EXCAVATION CONDITIONS.
3.) CONTOURS DO NOT SHOW CONTOURS OF PIPE TRENCH EXCAVATIONS.

LEGEND

- TREE LINE
- O/H — OVERHEAD POWER LINE
- PROPERTY LINE
- LAMP POST
- POWER POLE
- OW5-86 ● OBSERVATION WELL
- STA. 10+00 ✕ RAVINE REFERENCE STATION LINE
- FORMER LIMITS OF CONCRETE PLANT SLAB
- TYPICAL EXCAVATION DEPTH AREAS

Nº	Revision	Date	Initial

Approved

PRINTED ON
OCT 27 1993

FORMER P.R. MALLORY PLANT STE CRAWFORDSVILLE, INDIANA.

PHASE III REMOVAL ACTION REPORT

CONTOUR PLAN – FINAL EXCAVATION DEPTHS

CRA
CONESTOGA-ROVERS & ASSOCIATES

Drawn by: R.B.B.	Scale: 1"=40'	Date: OCTOBER 1993	File Nº: P-61	Rev.Nº: –
Designed by: J.A.C.	Field book:	Project Nº: 1916	Drawing Nº: 5	
Checked by: J.A.C.				

SEPT 20/93(W)

LEGEND

- TREE LINE
- O/H — OVERHEAD POWER LINE
- PROPERTY LINE
- O LP — LAMP POST
- O PP — POWER POLE
- OW5-86 ● — OBSERVATION WELL
- PIPE 7 — PIPE TRENCH IDENTIFICATION NUMBER
- TOP OF SLOPE
- RAVINE FLOW LINE
- LIMIT OF FORMER CONCRETE PLANT SLAB

Nº	Revision	Date	Initial

Approved

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FORMER P.R. MALLORY PLANT SITE
CRAWFORDSVILLE, INDIANA

PHASE III REMOVAL ACTION REPORT

PIPE TRENCH AND
UNDERGROUND TANK LOCATIONS

CRA
CONESTOGA-ROVERS & ASSOCIATES

Drawn by: R.B.B.	Scale: 1"=40'	Date: OCTOBER 1993	File Nº: P-60	Rev.Nº: –
Designed by: J.A.C.	Field book:	Project Nº: 1916	Drawing Nº: 6	
Checked by: J.A.C.				

SEPT 17/93(W)

NOTES:
1. CONTOURS SHOW GEODETIC ELEVATIONS.
2. NORTH BANK OF LITTLE SUGAR CREEK EAST OF CONFLUENCE OF RAVINE AREA IS APPROXIMATED.

LEGEND

- TREE LINE
- O/H — OVERHEAD POWER LINE
- PROPERTY LINE
- LP LAMP POST
- PP POWER POLE
- OW5-86 ● OBSERVATION WELL
- STA. 10+00 X— RAVINE REFERENCE STATION LINE

Nº	Revision	Date	Initial

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FORMER P.R. MALLORY PLANT SITE
CRAWFORDSVILLE, INDIANA.

PHASE III REMOVAL ACTION REPORT

FINAL GRADING PLAN

CRA
CONESTOGA-ROVERS & ASSOCIATES

Drawn by: R.B.B.	Scale: 1"=40'	Date: OCTOBER 1993	File Nº: P-48	Rev.Nº: –
Designed by: J.A.C.				
Checked by: J.A.C.	Field book:	Project Nº: 1916	Drawing Nº: 7	

SEPT 17/93(W)

LEGEND

- TREE LINE
- O/H — OVERHEAD POWER LINE
- PROPERTY LINE
- LP LAMP POST
- PP POWER POLE
- OW5-86 ● OBSERVATION WELL
- STA. 10+00 ✕ RAVINE REFERENCE STATION LINE
- CRUSHED STONE SURFACE
- STONE RIP-RAP
- REVEGETATED WITH TOPSOIL AND GRASS

Nº	Revision	Date	Initial

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FORMER P.R. MALLORY PLANT SITE
CRAWFORDSVILLE, INDIANA.

PHASE III REMOVAL ACTION REPORT

SURFACE RESTORATION PLAN

CRA
CONESTOGA-ROVERS & ASSOCIATES

Drawn by: R.B.B.	Scale: 1"=40'	Date: OCTOBER 1993	File Nº: P-71	Rev.Nº: -
Designed by: J.A.C.				
Checked by: J.A.C.	Field book:	Project Nº: 1916	Drawing Nº: 8	

SEPT 16/93(W)